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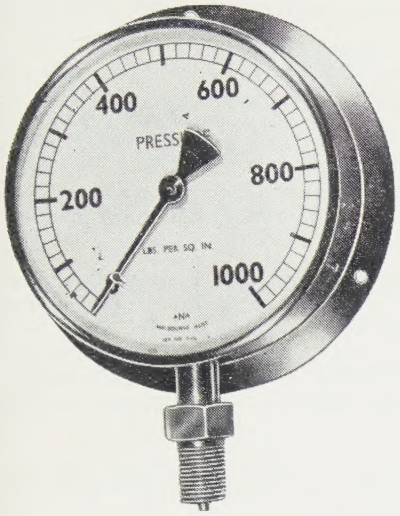

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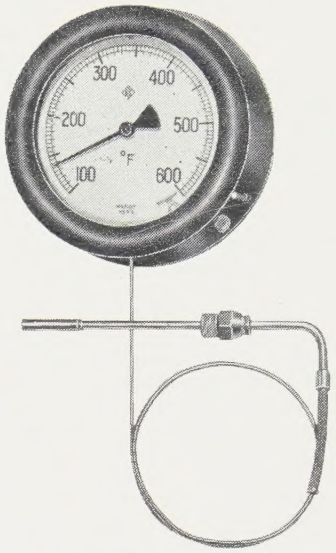

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The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of island territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to advise the participating Governments on ways of improving the well-being of the people of the Pacific island territories. It is concerned with health, economic and social matters. Its headquarters are at Nouméa, New Caledonia.

The Commission consists of not more than twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

There is a Research Council meeting once a year. This may be either a meeting of the full Council, or of one or other of its three main sections, specializing in the fields of health, economic development and social development. Members of the Research Council are appointed by the Commission. They are selected for their special knowledge of the questions with which the Commisison is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission on what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

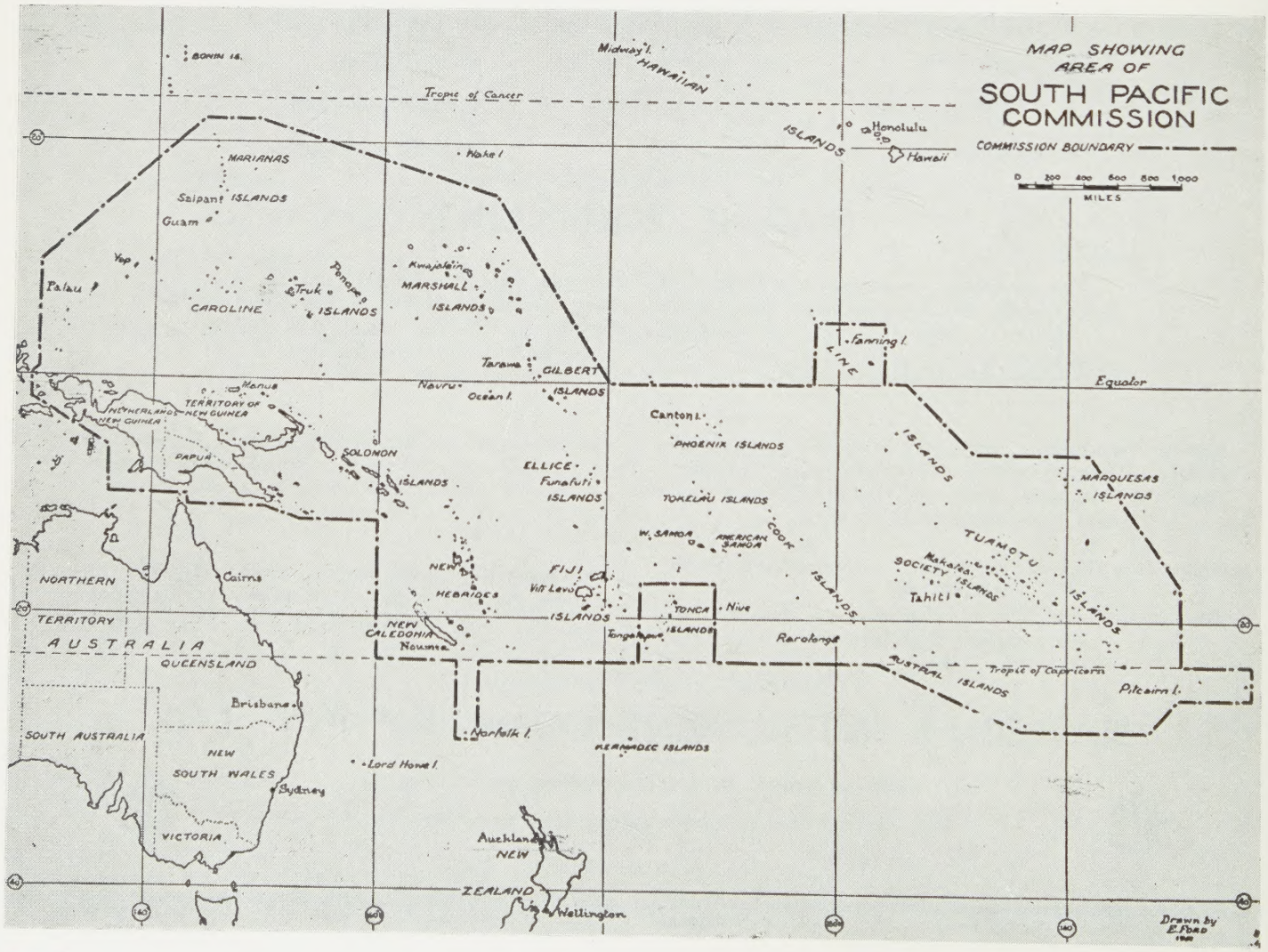
The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Fiji in April 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April 1953. The third Conference was held in Fiji in April-May 1956.

The principal officers of the Commission are: Secretary-General, Mr. Thomas R. Smith; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Dr. Richard Seddon. The powers and functions of the Deputy Chairman, Research Council, are exercised by the Secretary-General.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

FRONT COVER PHOTOGRAPH

Mr. Maurice Cottin (left) of the Agricultural Service of New Caledonia, with Dr. Jacques Barrau, plant introduction officer, South Pacific Commission, examining coffee seedlings recently introduced to the region by the Commission.



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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

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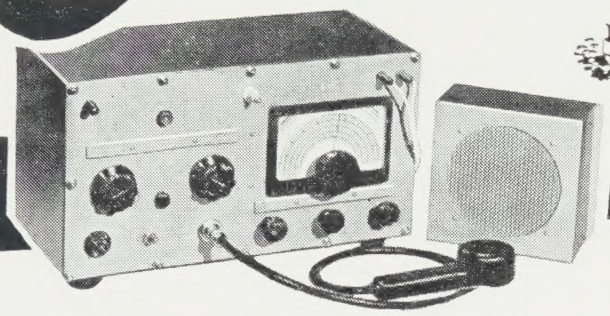

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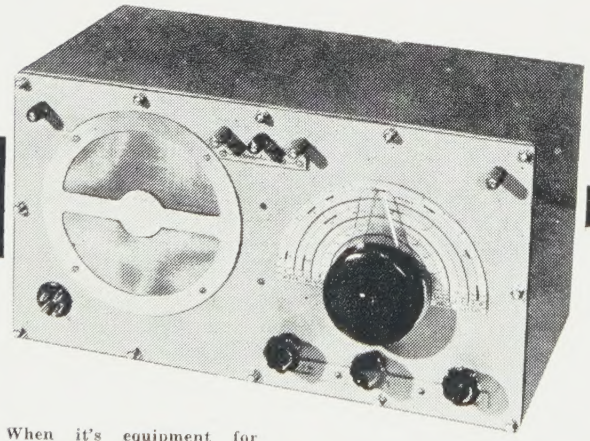

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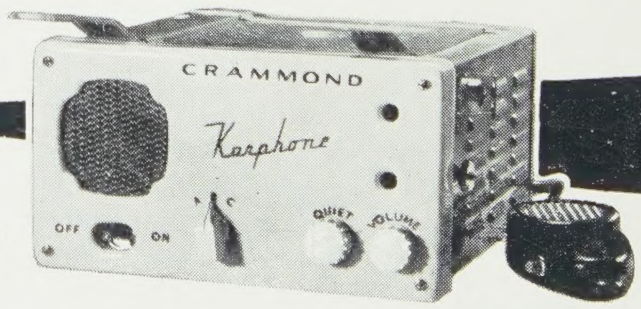

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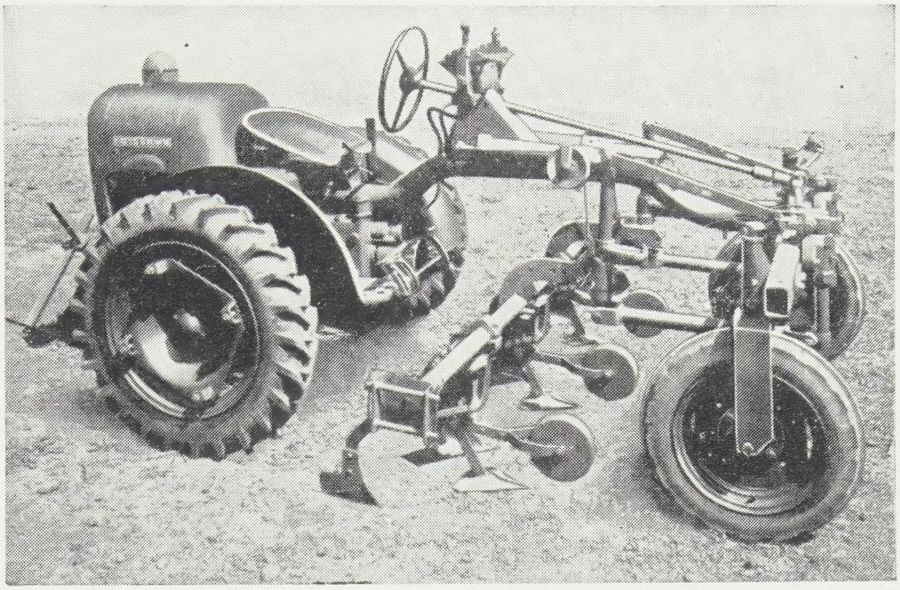

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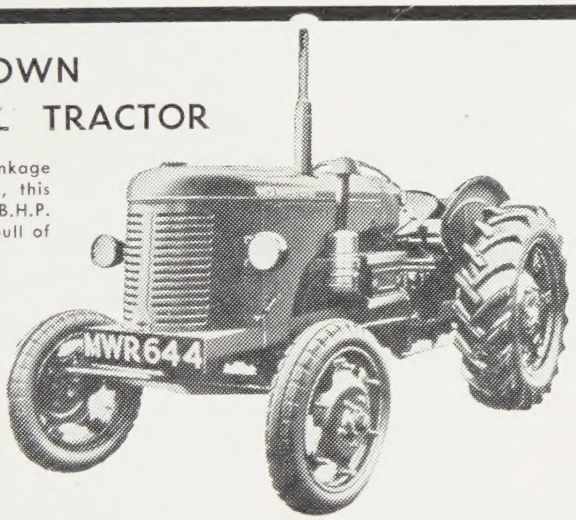

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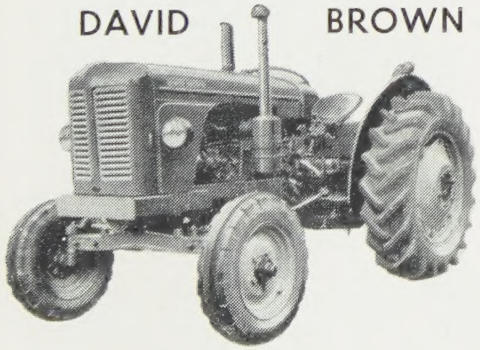

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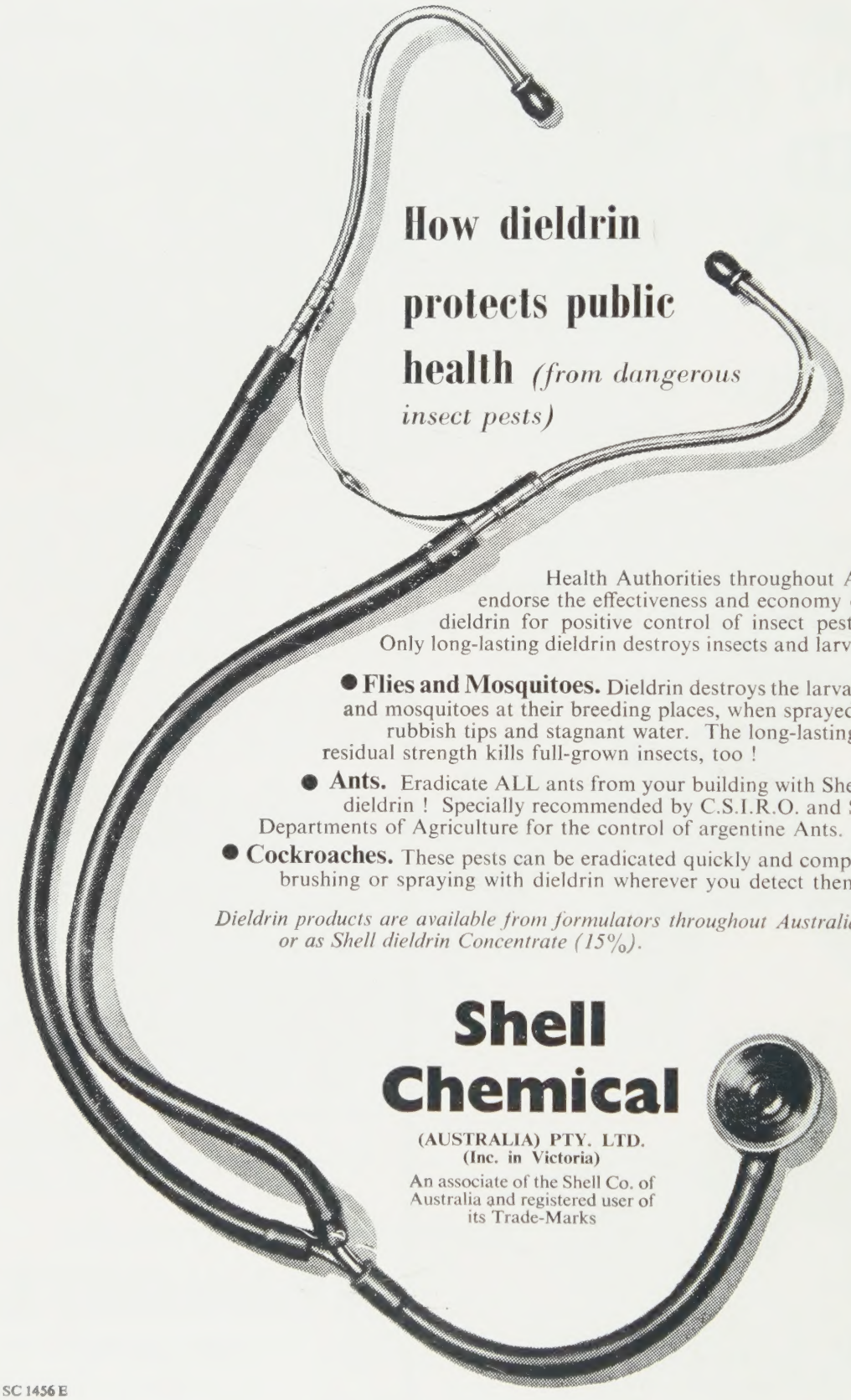

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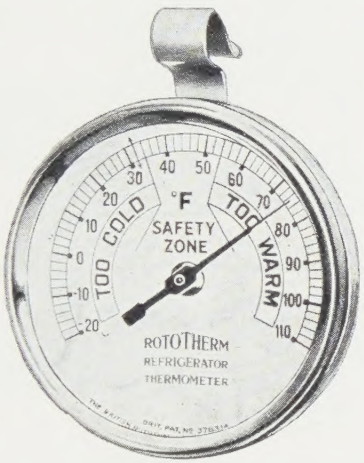

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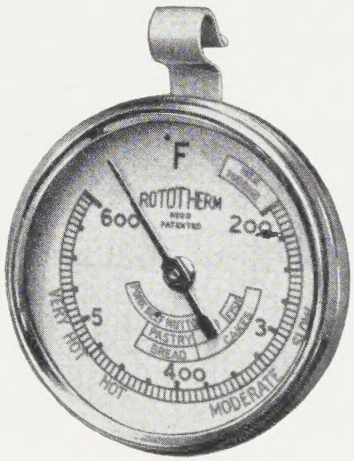

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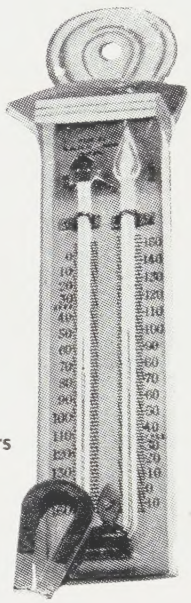

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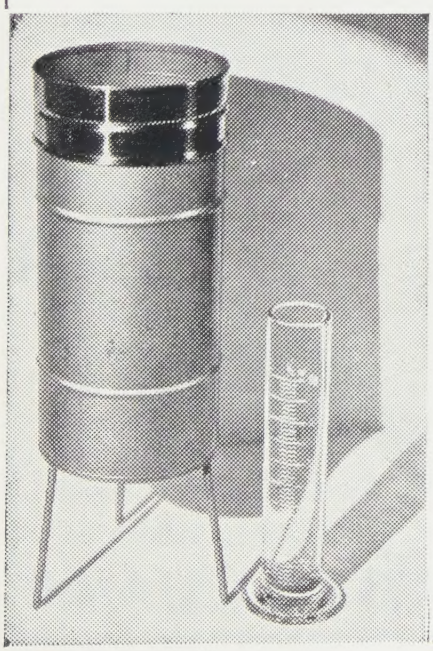

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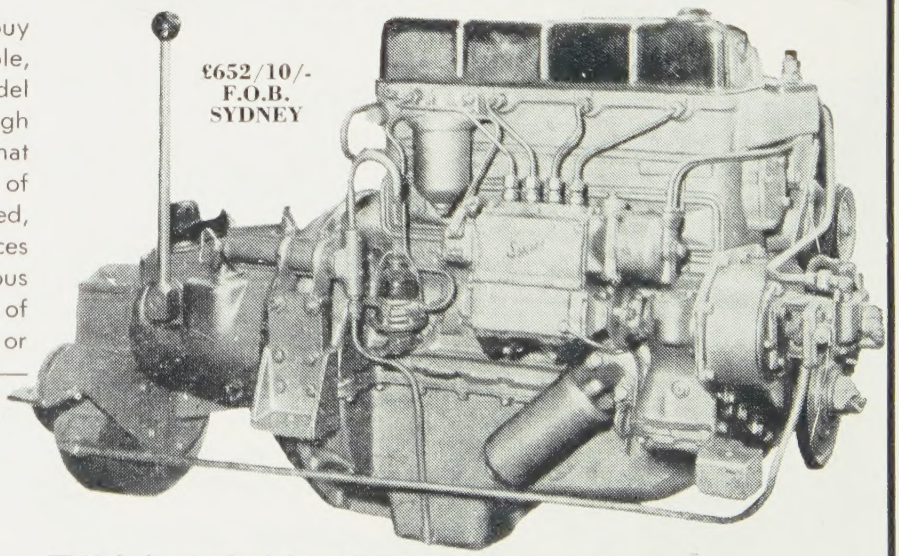

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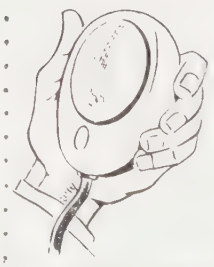

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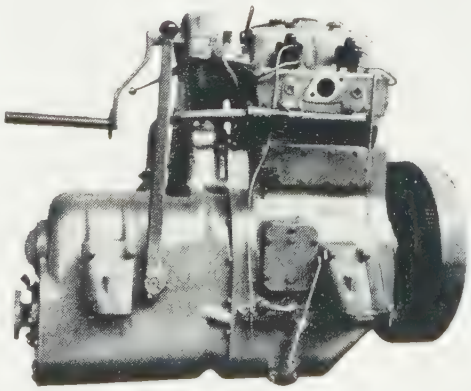

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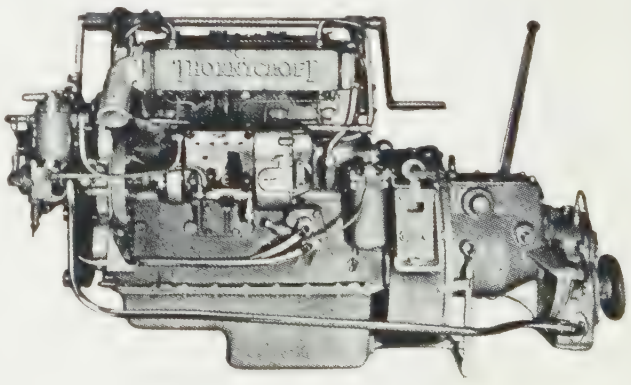

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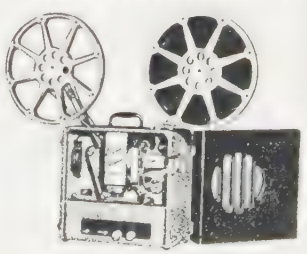

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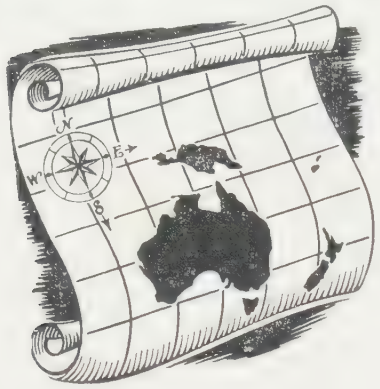

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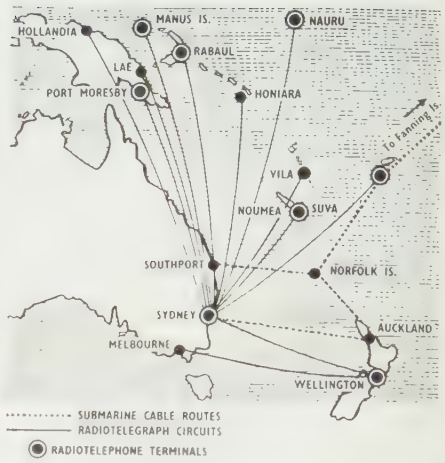

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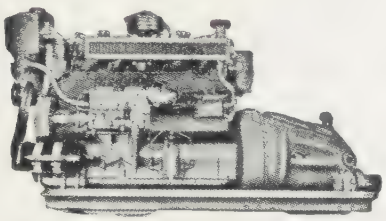

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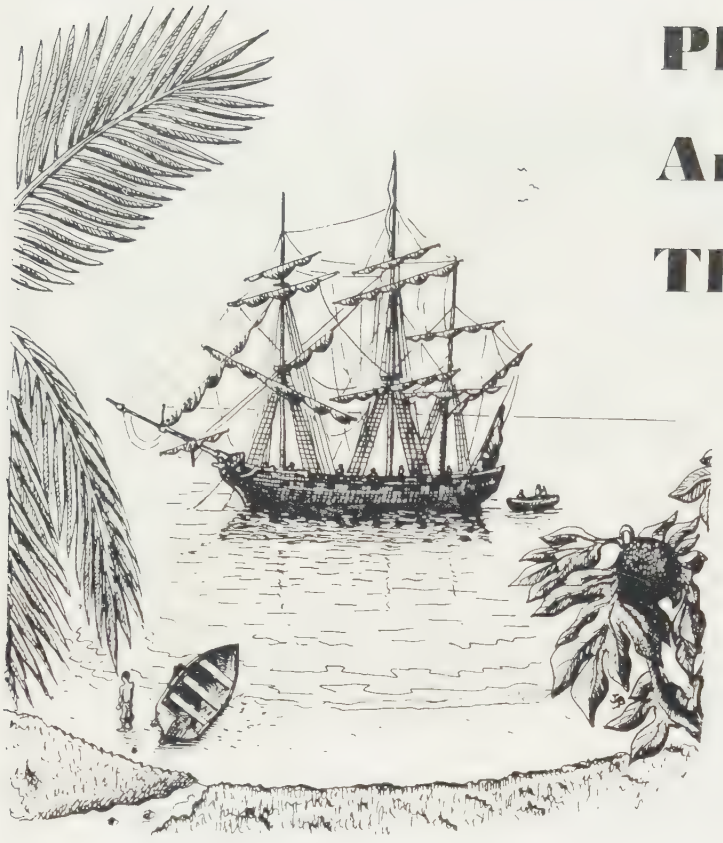


Plant Introduction And Exploration In The South Pacific

From the days of the early Pacific migrations the introduction of useful plants to the region has played a major part in its development. In this article the author discusses the importance of plant introduction and exploration in the area, and explains why the South Pacific Commission has from its inception paid special attention to fostering this activity.

By JACQUES BARRAU*

An impression by the author of H.M.S. "Bounty" under Captain Bligh lying at anchor off a Pacific island while her crew collect breadfruit cuttings ashore.

LONG before Europeans appeared in the South Seas many useful foreign plants had been introduced into the region in the course of the migrations which started populating Oceania. In this way practically all the food plants which formed the basis of insular economy in early times reached the islands, whose flora boasted very few useful varieties. To quote only two examples, yams and taros came from the west with the ancestors of the present-day islanders, and in several territories became their principal means of subsistence.

Learning From Past Experience

It would take too long to review the fascinating aspects of South Pacific history which tell of the origin of pre-European economic plants and the manner of their introduction into the region. Those must have been incredible voyages by frail craft, destination unknown, carrying among other items of cargo, plants and tubers from the distant lands whence these migrations had originated.

We must instead restrict ourselves to the European explorers of more recent times, the first of whom brought plants with them to the islands. At the end of the sixteenth century the expedition led by Pedro Fernandez de Quiros and Alvaro de Mendana visited the Marquesas and Santa Cruz, where they planted maize. During the seventeenth century sweet potatoes were brought from Mexico to Guam, while during the eighteenth century, Captain Cook introduced citrus fruits and pineapple into Tahiti.

Some years later the French Admiral Bruni d'Entrecasteaux set sail for the Pacific in search of Lapérouse, who had vanished on the high seas. With him were a botanist, Hoton de la Billardière, and a gardener, Lahaie. In his diary, the latter states that he planted or distributed to the native populations of the islands he visited, some twenty varieties of seeds of European vegetables.

In the field of botanical economy, European navigators not only introduced plants but also searched for any growing in the South Sea islands which could be of use in tropical countries already colonized. Thus in 1787 Captain William Bligh of H.M.S. *Bounty*, was ordered to Tahiti to bring back breadfruit tree cuttings. In those days the breadfruit enjoyed great fame, due mainly to the enthusiastic reports of botanists who had accompanied Cook on his voyages in the South Seas. The adventures of H.M.S. *Bounty* and the famous mutiny which broke out on board are now common knowledge through historical novels and films. The naturalists of the d'Entrecasteaux expedition, La Billardière and Lahaie, also tried to collect and transport planting material of the fabulous breadfruit tree; in those days the introduction of plants and the search for new varieties of useful plants went hand in hand.

Under European colonization and with the establishment of Christian missions, the number of useful plants introduced into the islands increased. The older Spanish colonies, especially Guam, were the first to benefit. Later, during the nineteenth century, introductions were made in other territories. In 1824 the Reverend Ellis brought lemon, tamarind, guava, coffee, custard apple trees, as well as various vegetables, from Hawaii to Tahiti. In 1845, the *Bulletin de la Société Royale d'Horticulture de Paris* (Gazette of the Royal Horticultural Society of Paris) published a survey by Monsieur Petit, an officer in the First Regiment of Marines, giving an account of results achieved in Tahiti in the acclimatization of some thirty varieties of useful plants.

These are only a few instances: the list would be too long if one endeavoured to quote here the names of all those who have helped to enrich the economic flora of the South Pacific islands. We will, however, dwell briefly on two of these pioneers whose memory should be kept alive.

The first is the Russian explorer Mikloukho-Maklai, who lived on the northern coast of New Guinea from 1871 to 1879. His interest in improving the lot of the indigenous population was an unusual thing in those days. To this end, and amongst other noteworthy

* Plant Introduction Officer, South Pacific Commission.

achievements, he introduced numerous varieties of food plants.*

The other pioneer was Harrison Smith, a brilliant American engineer who—no doubt weary of an over-civilized life—started roaming around the Pacific, finally settling down in Tahiti. There he created a wonderful introduction garden with collections of botanical curiosities, useful and ornamental plants. One of his introduction—a pomelo from Sarawak—has become popular all over the island, and is progressively becoming a commercial fruit which is already on the export market.

These numerous introductions had considerable economic value, for many of the subsistence plants brought by the Europeans are now used daily by the islanders. Such is the case with cassava and the varieties of *Xanthosoma*. There are many other examples, among which mention will be made only of coffee and cacao. Commercially, these are becoming increasingly important crops in the region.

Breadfruit tree branch bearing fruit and foliage. (Reproduced from an old engraving.)

Risks Incurred

From this rapid survey, it will have become evident that all these plant introductions have not taken place without mishap. In some islands the guava, imported for fruit, has overrun the land and has become a pest. The *Lantana*, introduced to adorn gardens, has run wild and become a noxious weed. In New Caledonia, *Cryptostegia grandiflora*, a vine introduced as an ornamental plant, is now encroaching on pasture land on the dry side of the island. Another unfortunate introduction is the prickly pear, so much so that it has become necessary to import a parasitic insect to control it. The same has been done for the *Lantana*.

Unfortunately the list of introduced plants which, far from being useful, have become real pests, is a very long one. When introduced into new territories, many plants find there ideal conditions for natural propagation, free from the insects and diseases which controlled them in their country of origin. Some of these plants thrive to a point where they become a nuisance.

Unfortunately, this is not the only risk: diseases and parasites also frequently enter the territories with newly-introduced plants. Coffee rust caused by *Hemileia vastatrix*, and the coffee bean borer, *Stephanoderes hampei*, reached New Caledonia with seeds and seedlings, and it is said that the dangerous rhinoceros beetle was introduced into the Samoan Islands with *Hevea* plants.

All this illustrates how carefully this task of introducing new plants must be carried out, though it must be admitted that, quite paradoxically, the accidental introduction of pests and diseases has in the past sometimes brought useful results. For example, when coffee rust invaded the *Arabica* coffee plantations of New Caledonia a new variety more resistant to the disease was imported from Java—the *Coffea canephora*, better known as Robusta.

Today some territories in the region are trying to discover varieties of black pepper which will resist the disease caused by *Phytophthora palmivora*. As

* This calls to mind an amusing anecdote. A few years later, when German settlers arrived in this part of New Guinea, they were amazed to find water-melon and maize grown by the local population, and called by their Russian names of "Koukourossa" and "Arbouz" respectively.

Coffee seedlings in a nursery under strict phyto-sanitary control. The greenhouse is one of many at the United States Department of Agriculture's research centre at Beltsville, near Washington. Several varieties of coffee trees recently introduced into South Pacific islands under South Pacific Commission auspices came from this Station.

An introduction station in the South Pacific—the nursery at the Ponape Gardens in the Caroline Islands. In foreground is black pepper from the introduction garden at Nadururloulou, Fiji.

another instance, Nigeria has recently imported cuttings of Samoan cacao, Lafi 7, because of its presumed resistance to the "Black Pod" disease, also caused by *Phytophthora palmivora*.

Thus it can be readily understood that today, whenever the introduction of a new plant is contemplated, the need for providing adequate quarantine measures is all-important. This is admittedly more often than not a difficult task in this region where there are so few stations equipped to ensure that introduced plants are put under proper observation on their arrival.

Aims of Plant Introduction

By now the reader probably has a fair idea of the value and also the difficulties of plant introduction. Let us now try and define the work of the South Pacific Commission, which in 1955 acted as a pioneer agency in promoting international collaboration in this field by calling a meeting of plant introduction specialists at Canberra. These consultations have enabled the Commission to direct its work most usefully, and also to define the introduction of plants as *". . . the procurement, locally or from abroad, and the preliminary evaluation, propagation and distribution of wild and cultivated economic plants"*.

This may seem obvious, and therefore of little interest. In fact, it is the first time that the scope of plant introduction has been defined.

The steps for carrying out the work are:

(i) Investigation of the species or variety best suited to local requirements and collection of all available information thereon.

(ii) Introduction of the selected plant into a given territory or area, under the best possible conditions of transport, quarantine and acclimatization.

(iii) Observations on how the introduced plant reacts, to determine if it will adapt itself to its new environment.

Once this last stage is reached the actual work of introduction is finished, and cultivation trials—or even propagation for distribution—can then be undertaken. However, in most cases distribution follows cultivation trials.

Territorial Co-operation Of Great Value

Undoubtedly inter-territorial co-operation is of great advantage in this field, especially in the South Pacific area. If various territories undertake plant introduction separately they may unknowingly duplicate their efforts and, in any case, much useless expenditure can be avoided by joint action throughout the area in islands under different administrations.

In this field the task of the South Pacific Commission has just entered a new phase which during the last few months has yielded the following results:

I. The establishment of an "information network" outside the area capable of keeping us informed about all plants, species and varieties which may be of economic value to our islands.

II. The promise of outside technical help to enable us to procure the plants we need, with the guarantee that they are free from diseases and parasites.

III. The study of the most practical means of transport for plants sent to the area.

IV. The gathering of data concerning the methods of work which prevail in organizations concerned with plant introduction and botanical exploration, and which function for the benefit of several metropolitan countries. (A good example of such a service is the "New Crops Research Branch" of the United States Department of Agriculture.)

However, it must be noted that the methods and objectives of plant introduction in the South Pacific differ somewhat from those in better-developed areas. For instance, when the New Crops Research Branch of the United States Department of Agriculture undertakes plant introduction or botanical exploration, it is very often in order to find plants suitable for selection or hybridization. Our main concern is to obtain already-improved varieties.

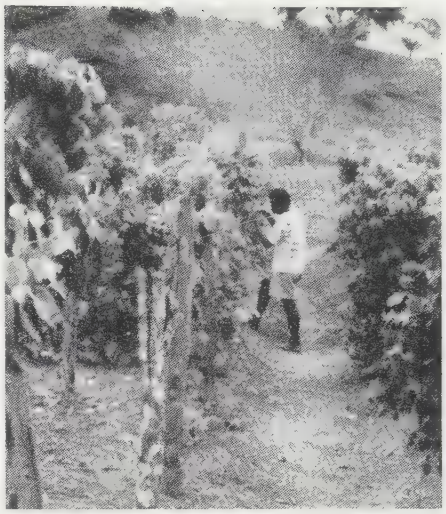
Commission Objectives

In order that the Commission's work in plant introduction may be better understood, we believe it would be useful to state its aims clearly. They are:

(i) The Introduction of New Crops. During the last few years several varieties of black pepper have been introduced into territories within the scope of the Commission. This new crop has not yet reached a commercial stage, but is still undergoing cultivation trials. It is worth while mentioning that an interesting variety of black pepper was introduced and propagated at Nadururloulou, Fiji, and that a large number of cuttings have been sent from there to other islands.

(ii) Improving and Developing Long-Established Crops. In some territories of the area *Arabica* coffee is grown commercially, but could be improved by the introduction of certain new varieties, such as those resistant to coffee rust caused by *Hemileia vastatrix*. Several *Arabica* varieties and other species have recently been introduced into the South Pacific islands under the auspices of the Commission. As there are not many well-organized quarantine stations in the region, seedlings have been obtained from the greenhouses of the well-equipped quarantine station at Beltsville, the centre for Agronomic Research in the United States, which is located near Washington, D.C.

This is not the first time that this



Two views, taken by the author, of the black pepper plot in the Naduruloulou introduction garden near Suva, Fiji. During 1957 over 500 cuttings of black pepper, a potential cash crop for the region, were sent from Naduruloulou to various South Pacific territories.

method of introduction has been used. Many of the cacao cuttings introduced at Naduruloulou came from the Royal Botanical Gardens at Kew, near London. At these quarantine stations, the plants are propagated under the close supervision of entomologists and phytopathologists, and exported only with the maximum guarantee concerning their condition.

Plant Exploration

The aims of botanical exploration in the South Pacific in search of useful plants are also worth while mentioning here. They may be defined as follows:

(i) To discover among the plants cultivated in the area some species or varieties, the usefulness of which may not have yet been noticed. For example, in Tahiti there is a vegetable, *Xanthosoma brasiliense*, which would definitely be of value in improving the food pattern of other islands. It should most certainly be introduced into other territories. This one example shows that a survey of subsistence plants already established in these islands might reveal species and varieties capable of being introduced with advantage into other territories.

(ii) To discover amongst the wild plants growing in the islands of the South Pacific those which could be of economic value. An example is *Duboisia myoporoides*, a wild solancea of New Caledonia which could be grown commercially for medicinal purposes. This species has not yet been thoroughly investigated. Our task is not to undertake a study of this kind, but we can draw the attention of territories to the possible usefulness of such plants.

Ways And Means Of Plant Introduction

During the past few years the Commission's practical activities in plant introduction have been carried out with the full collaboration of the Fiji Department of Agriculture at the latter's plant introduction and quarantine station at Naduruloulou, near Suva. A considerable number of species and varieties of economic plants have been gathered together in this Garden, which has rapidly become an active centre of propagation and distribution. There can be no doubt as to the great value of this service, from which several territories in the Eastern Pacific have already derived great benefit.

Experience has shown, however, that it is difficult for the Commission to carry out its work effectively with only one introduction garden for the whole Pacific region. This is obvious, considering the difficulties encountered in distributing plants to some islands using present communications.

The trend is therefore now towards de-centralization, and our main task is to help territories requesting such assistance to introduce the plants in which they are interested. As many territories have similar needs, co-ordination is necessary, and the South Pacific Commission is undoubtedly the right agency to provide this. Further, it is able to facilitate the exchange of plants within the area and keep the territories informed about economic plants it might be desirable for them to introduce.

In addition to its work with Naduruloulou, the Commission will keep in close contact with, and maintain liaison between, introduction and quarantine stations in other territories. The data compiled concerning plant parasites and diseases inside and outside the area will enable all necessary quarantine measures to be taken. Further, as already stated, we have been promised the help and co-operation of quarantine stations outside the area, and are thus assured that plants imported into the region will arrive under the best possible conditions.

Already during the last few months several territorial administrations have asked us for assistance and advice in the introduction of various plants such as bamboo, coffee, black pepper, fruit trees, cereals, grasses and legumes, and fodder plants. This is very encouraging in that it shows that there is a real need for the work the Commission is doing in the field of plant introduction.

Conclusion

In order to improve his resources and well-being, man has from time immemorial been in search of useful plants, has cultivated them and carried their cultivation far from their original habitat. These activities are as old as agriculture itself.

The majority of plants at present under cultivation for commercial or food purposes in tropical countries have been introduced from other tropical areas. Practically everywhere the development of new crops has been based on plant introduction and exploration. These are tasks which we are endeavouring to carry on today for the benefit of the territories of the South Pacific.

ORIGINAL TEXT: FRENCH.

"Land And Sea" Fisheries Co-operative

In Netherlands New Guinea, the "Land and Sea" Co-operative Fishermen's Society was recently formed by one hundred and thirty-nine fishermen from groups living over the Hollandia Lagoon (most of their houses are built on poles over the water).

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The Society, which runs a consumer store and cafe-club, helps its members with credit to buy their outboard motors and fishing gear.

Left: Dr. Hoyt visiting one of the several compost piles which were stocked with rhinoceros beetle larvae to attract natural enemies. Nossy Be, Madagascar. Above: Madagascans helping in the search for predators of rhinoceros beetle larvae near the forest station of Perinet.

PROGRESS REPORT ON . . .

SPC Rhinoceros Beetle Campaign

Recent developments in the South Pacific Commission's campaign to control the coconut rhinoceros beetle (Oryctes rhinoceros, L.) *in the Pacific islands it infests are reported below.*

EARLY in 1957 the Commission's entomologist, Dr. Charles P. Hoyt, spent five months in Madagascar investigating the role played by various insects there in the control of the numerous species of native rhinoceros beetles. In a village on the east coast of the island a medium-sized carabid beetle, *Scarites madagascariensis,* was found to prey on a variety of grubs including those of a native rhinoceros beetle, *Oryctes ranavalo*. Numerous observations were carried out by Dr. Hoyt to determine its habits in nature, made for example by following the predators around with a torch at night. The results of these indicated that this carabid would be a safe and useful insect to introduce to the islands of the South Pacific as an enemy of the coconut rhinoceros beetle grub.

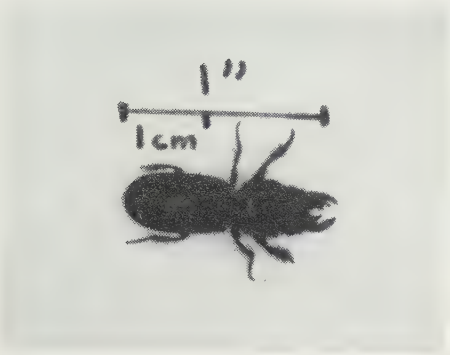
Aided by the generous assistance of the Department of Agriculture of Madagascar a large colony of these beetles was finally located and 175 were collected. These were taken to the Department's laboratories in Tananarive and kept there until the departure of an aircraft for Mauritius, Sydney (Australia) and finally the Fiji Islands.

Twelve beetles died in Tananarive, leaving 163 to begin the long journey to Fiji. At Suva, 131 were found to have survived. These were liberated in suitable sites where it was hoped they might find conditions to their liking.

Since this initial shipment of *Scarites madagascariensis,* the Department of Agriculture (Division of Agricultural Entomology) in Madagascar has been able to collect and ship two additional lots. The last of these was sent through Nouméa, New Caledonia, and has been liberated on Wallis Island by Mr. F. Cohic, entomologist of the French Institute of Oceania.

In March 1957 Dr. Paul Surany, an insect pathologist studying the diseases of the rhinoceros beetle as part of the

In the village of Maroantsetra, Madagascar. The palms in this area are almost free from damage by Oryctes. It was in this general location that Scarites madagascariensis was found for the first time in numbers.



Above: The carabid beetle found in Madagascar by Dr. Hoyt, and which has since been introduced in Fiji and Wallis Island to help control the rhinoceros beetle. Right: The nematode Rhabditis sp. which was found by Dr. Paul Surany in Ceylon parasitizing Oryctes rhinoceros larvae. This parasite worm has now been introduced to Fiji, the Samoas and Wallis Island to help control the rhinoceros beetle.

Commission's programme to control this pest, discovered a parasitic nematode worm attacking rhinoceros beetle grubs in Ceylon, and sent a colony of these to Fiji. Mr. B. A. O'Connor, senior entomologist of the Fiji Department of Agriculture, has been able to maintain a large colony of these nematodes and has since distributed them to American and Western Samoa and to Wallis Island, as well as making several releases in the beetle-infested areas of Viti Levu.

While it cannot be said at this time that either of these enemies of the coconut rhinoceros beetle will be able to control it effectively, nevertheless it is felt that if they are able to maintain themselves under Pacific island conditions they will make a positive contribution towards making them an unfavorable place for this pest.

New Secretary-General For South Pacific Commission

Mr. Thomas Richard Smith, who last month relinquished his post as Secretary to the Government of Western Samoa, will take up appointment as Secretary-General of the South Pacific Commission in late February or early March, after the retiring Secretary-General, Dr. Ralph Clairon Bedell, has returned to the United States to resume government service in Washington.

Mr. Thomas Richard Smith

Mr. Smith, who holds the degree of Master of Commerce and Diploma of Public Administration, is a highly-qualified administrator of wide and varied experience, gained mainly in the service of the governments of New Zealand and Western Samoa. In 1953 he was sent under the United Nations technical assistance programme to Indonesia as adviser on public administration to the Government of that country. In 1956, and again last year, he attended the United Nations Trusteeship Council meetings in New York as special representative for New Zealand.

Mr. Smith was Chairman of the Western Samoa Copra Board, and last year represented the territory at conferences held in London with copra buyers and producers from the main coconut-growing areas of the world.

Commission's Plant Introduction Officer Takes Up Post

Last October Dr. Jacques Barrau returned to Commission headquarters from Paris to take up appointment as plant introduction officer.

This is his second Commission post. Previously, until August 1956, when he left Noumea for France to take his doctorate in economic botany, Dr. Barrau had spent four years with the Commission surveying subsistence agriculture in the Pacific islands. During this time he visited every territory in the Commission area. His reports included *Polynesian and Micronesian Subsistence Agriculture* and *Subsistence Agriculture in Melanesia.* He was also co-author with Dr. Emile Massal, who is in charge of the Commission's health programme, of *Food Plants of the South Sea Islands,* published in September 1956 in the Commission's Technical Paper series (No. 94).

On his way back to New Caledonia from France Dr. Barrau visited several plant quarantine and introduction stations in Europe and the United States. In a greenhouse at Kew Royal Botanical Gardens near London he inspected several cuttings of the Samoan cocoa Lafi 7 which were ready to be shipped to Nigeria, and cuttings of improved varieties of cocoa from the Carribbean region being prepared for shipment to Fiji.

In the United States Dr. Barrau saw in a greenhouse near Washington, D.C., Tahitian breadfruit varieties growing from cuttings he had sent there in 1956 from the South Pacific. These will be sent later to Puerto Rico. In exchange he obtained seedlings of improved varieties of coffee and planting material of several bamboo species. These plants have been divided among Western Samoa, Fiji, and New Caledonia, where they are being tested. If they show promise they will later be distributed to other South Pacific Islands.

Child Welfare Centre In Noumea

In November 1956 the French Red Cross authorities in New Caledonia inaugurated a Child Welfare Centre in Noumea with the opening of a day nursery. Next to be set up will be a pre-school centre as a link between day nursery and school. This article describes the organization, programme and prospects of Noumea's Child Welfare Centre, on which will be based all efforts to improve child welfare in the territory.

By YVETTE LEFEVRE*

The spacious garden with its wide tree-shaded lawns provides ample playing space for the children.

THE Centre is located in the heart of Nouméa, close by one of the busiest crossroads of the town. The garden, with its lawns shaded by tall trees, is green and cool. As soon as the gates close behind the occasional visitor, the noise of the town is deadened and a feeling of peace and quiet prevails. The stillness is broken only by the voices of the children intent on their games.

The Red Cross enjoys the use of this beautiful site through a long lease granted by the territorial Government.

After many attempts and delays the Centre finally opened in November 1956, the first tangible result of the tenacity and devotion of the Red Cross authorities and the generosity of the public.

The Centre is run by a State-registered nurse specialized in child welfare. Its administration is the responsibility of a technical and administrative board appointed by the local Red Cross. The Board is composed of five members, including the medical practitioner in charge of the Centre, and meets approximately once a month.

Categories For Admission

Children of French nationality aged from birth to four years are admitted, whatever their race or origin, provided they come into one of the following categories, and according to the priority set out below:

—mother compelled to work because she is either widowed, divorced or unmarried;

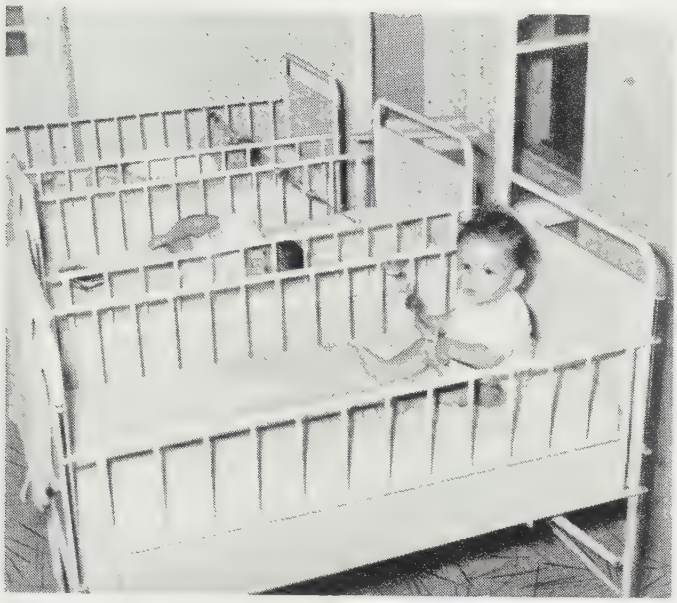
—mother the sole bread-winner because the father is away or temporarily incapacitated;

—child dependent entirely on the father

Left: Waiting line at the shower station. The children have a bath or shower twice daily—in the morning when they come in from play in the garden before their midday meal, and in the evening just before going home.

Right: The Centre, headquarters for child welfare activities in the territory.

* Miss Lefèvre, who is in charge of the Child Welfare Centre in Nouméa, is a State-registered nurse who has specialized in child welfare.



A daily siesta is strictly enforced from 11.30 a.m. to 2.30 p.m. Even if they do not sleep, the children must stay in their cots.

Right: Spoon feeding of infants is begun during the fifth or sixth month.

because the mother is away or unable to work;

—both parents compelled to work;

—temporary admission (confinement or illness of mother).

Each case is judged on its own merits by the territorial Welfare Centre and the Administrative Board of the Centre. Exceptionally, and with the approval of the Board, children who do not come within any of the above categories may be admitted if there are any vacancies.

A certificate of vaccination against smallpox is compulsory for every child on admission, as well as a certificate of inoculation against diphtheria and tetanus for children aged one year or more. Sick children are not admitted.

The Centre is open every working day from Monday morning to Saturday noon. Children are admitted between 6.45 and 7.30 a.m. and remain there until 5 or 5.45 p.m., when they are handed over only to the people who brought them or to duly-authorized custodians.

After admission, a file is opened for each child. The information recorded covers all necessary data concerning the child's growth and development, a copy of registration in the Centre's admittance book, a copy of registration in the daily roll-call book, and an account of daily menus (for infants, details of individual feeding are recorded).

Parents pay a monthly contribution towards expenses, the amount being proportional to their income. Contributions range from 1000 to 3500 francs C.F.P.*

Financial help, or even free admittance, may be granted temporarily in special cases, following enquiry by the Welfare Service and approval by the controlling Board.

Staff And Accommodation

The staff comprises the head of the Centre, who is a State-registered nurse specialized in child welfare, a trained assistant, four young girls recruited locally, a woman in charge of linen, a cook and a labourer.

The day nurseries, decorated in bright gay colours, can house approximately fifty children. They are divided into two parts — INFANTS and SMALL CHILDREN.

Each section is provided with a dressing room, bathroom equipped with tubs, showers and lavatories, and a dormitory. In the SMALL CHILDREN section there is a large verandah and a dining room equipped with diminutive furniture brightly painted in varied colours.

The head of the Centre has her office between the two sections, and glass partitions on either side make it easy for her to supervise the dormitories.

The kitchen, pantry and laundry are equipped with the latest devices.

Menus Vary With Age

Naturally, menus vary with the age of the children.

Infants are fed with the brand of milk ordered by the family doctor. From three months onward, cereals are introduced first of all as decoctions, then as thin gruel which is progressively thickened.

When babies are four months old, vegetable broth is introduced into their diet, then gradually replaced by soups and purées. Spoon feeding is started during the fifth or sixth month.

Every day at noon infants are given fresh fruit juice.

The older children's diet is based mainly on mashed potatoes, mixed with meat three times a week, otherwise with fresh vegetables. To avoid monotony, the mashed potatoes are sometimes replaced by pulses. Occasionally the menu includes eggs and cheese. Raw or cooked fresh fruit, or jam, is served as dessert.

The midday meal is served around 11 a.m. As well, the children are given, morning and afternoon, a cup of milk with bread and butter, cereal or biscuits.

Children Mostly In Garden

The children spend most of their time in the garden. There are games and toys, unfortunately not yet in sufficient quantity. With the help of the South Pacific Commission a study is being made to provide educational games.

A siesta is strictly enforced from 11.30 a.m. to 2.30 p.m. Even if the children do not sleep, they are made to stay in bed.

The children have a bath or shower twice daily—at 10 a.m. when they come in from the garden before their midday meal, and at 5 p.m. before going home.

Attendance Growing Rapidly

The Centre was opened in November 1956, with fifteen children and a total of 254 days of attendance recorded during that month. The following figures

* £1 sterling equals 214 francs C.F.P.

will show how rapidly its activities have expanded:

	Number of Children	Days of Attendance
	1956	
November	15	254
December	20	380
	1957	
January	38	590
February	41	529
March	43	871
April	41	810
May	44	797
June	45	917
July	60	1346
August	57	1346

The increase in number of children attending is partly due to advertising in the local press and over Radio Nouméa. It proves that the Centre obviously answers a very real demand. However, its scope is necessarily restricted by the facilities available, which is a matter of some concern to the local Red Cross authorities.

Educational Aspect

While the staff has an extremely heavy task, the training aspect of the Centre's activities, although still rather limited, has not been neglected.

So far training courses have been offered to students in domestic science at the Technical College (two students) and to trainees attending the nursing classes run by the public health service. A few girls have joined on a voluntary basis.

However, in its educational capacity, the Child Welfare Centre wishes to appeal not so much to this specialized staff as to the mothers themselves, to make them understand that this Centre is their Centre; that their suggestions will be discussed with them; that they must, at home, carry on and perfect the educational training given to their children and that, more than anyone else, they are responsible for this work in which the Centre has every desire to help and guide them.

Future Plans

The future of the Centre has been planned as follows:

"The first and foremost duty of the Child Welfare Centre is to teach and spread those elementary rules of child care which are a condition *sine qua non* of healthy growth for infants and young children.

"Young mothers must be guided in their heavy and absorbing duty, full of pitfalls; our modern society does not always make this duty easier, nor is it very encouraging or helpful, as so many couples are forced to work hard only to eke out a meagre living.

"The town woman, or the one who has lost her customary or family bearings, or her normal setting, must be given a new support to enable her to adjust herself to living independently.

"No amount of schooling for girls will provide this guidance. First of all, schooling only reaches a small number of individuals, and school methods, often inadequate, withdraw woman from society and prepare her more for a diploma than for the social task for which she is built. This is where the work of the Centre can be invaluable in inculcating in many a mother the knowledge and facts which foster the health of the child and ensure that it is brought up with love and devotion.

"This task will be an easy one to perform, as the Centre, through its methods, its equipment and its staff, is a living example of practical teaching. Even those mothers who do not send their children to the Centre would be well advised to visit it in order to acquaint themselves with the equipment being used there and learn so many things satisfying to heart and mind; in other words, to discover the *art* of bringing up a child."

ORIGINAL TEXT: FRENCH.

This demonstration of a rotary cutter clearing lantana and guava was given during the field day.

Agricultural Equipment Demonstrated In New Caledonia

By JACQUES BARRAU

IN agricultural extension work, field demonstrations are one of the most efficient means of convincing the farmer of the usefulness of any new implement.

The best way of encouraging wider use of agricultural machines is to organize a day's demonstration of them in a rural centre. This also has the advantage of enabling farmers to meet and exchange views on the equipment on show, and to compare problems. Lastly, it provides an excellent opportunity for personal contacts between the agricultural experts of the territorial administration and the people who can put their knowledge to practical use—the farmers.

I attended just such a demonstration in New Caledonia on October 26 last, when several types of tractors and modern agricultural machines were shown. The event was organized by the local Department of Agriculture at La Foa, an important rural centre on the western side of the island. A large number of indigenous and European farmers attended.

Among the wide range of machines on display was the excellent small caterpillar tractor, Ransomes MG 6, equipped with a very extensive range of implements. It is most suitable for the island's smallholdings, including the coffee plantations. Special note was also taken of two heavy-weight bush clearing machines, one a wood-cutter, the other a *gyro-broyeur*. Both are of the "rotary cutter" type, and their usefulness needs no further proof in New Caledonia.

After the field demonstrations onlookers attended a showing of agricultural documentary films, followed by a brief lecture by the Director of the Department of Agriculture (Mr. J. Marinet), who drew practical conclusions from the day's activities.

Pacific Copra Production Near Possible Serious Decline

Large-scale planting of coconuts throughout the Pacific is urgently needed if copra production in the region is not to suffer serious decline within the next few years. For quickest returns the author suggests the planting of the early-bearing Malayan dwarf coconut.

By D. R. A. EDEN

A magnificent head of coconuts on a Malayan dwarf palm. This palm is nearly twenty years old.

THE most serious threat to the general economy of the Western Pacific Islands lies in the dangerously high average age of their coconut palms.

Except where enemy action obliterated coconut areas and government-sponsored schemes resulted in their rehabilitation, the average has been shown by reliable estimates to be as high as sixty years in some island groups, while few territories can be found to boast an average palm age below forty years. Unfortunately these averages combine estimates covering both plantations owned and operated by companies and by private planters, and groves harvested by indigenous inhabitants.

In other words, it is at least forty years since there was any really extensive planting of coconuts in the Western Pacific either by the natives or by European interests.

Authorities agree that the maximum productivity of the coconut palm ends at about fifty years of age. Thereafter its yield declines gradually but surely until the palm dies, somewhere near one hundred years old.

Unless, therefore, the immediate planting of palms on a large scale can be encouraged, the overall production of copra from the Western Pacific must be on the verge of a serious decline.

Because the copra industry provides the principal source of income for many island groups, a continued and ever-increasing reduction in the volume of copra exported could prove to be a serious matter for most islands, and an economic disaster for some which have no other products for export.[1]

It is true that in recent years the total exports of copra from some territories has increased. This has been brought about, not by new areas of coconuts coming into bearing, but by the buoyancy of the copra market and the attractive prices which were being paid for the product. Native people have turned all their available coconuts into copra, using a smaller proportion for food and drinking nuts and forbidding their use for fattening pigs. Wastage of nuts has been reduced to a minimum.

It may be assumed that during the period of peak prices, maximum exports of copra have been shipped from the islands and, while present tonnages may continue to be exported for some years, unless large new plantings are undertaken an inevitable reduction may be forecast for the future.

In a report, *A Tour of the Copra Producing Areas of the Far East and Western Pacific*, H. D. Howard, U.K. Oil Mills Technical Section Executive, states:—

> "Due largely to the period of depression in the 1930's, the planters are very concerned about the future of copra and have not re-planted to any great extent to ensure adequate supplies for the years to come. They are thinking more in terms of secondary crops, such as cocoa, in case the price of copra drops below their cost of production."

While the objects of Mr. Howard's tour did not include research into ways and means of increasing coconut production, but were concerned only with copra production methods and quality, it is significant that his remarks should include the foregoing doubts as to adequate supplies being maintained in the years to come.

His remarks express the planters' doubts on prices being maintained in the future. I feel that an extension to Mr. Howard's paragraph would not be out of place.

After the financial buffetings they received in the '30s, when the export price of copra fell to a point below the cost of production, the punch-drunk coconut planters climbed wearily into the ring again after the last war ended and a world shortage of vegetable and animal fats forced up the price of copra to a profitable level. They even managed a little happy shadow-boxing when the London Ministry of Food decided to purchase copra on a long-term contract from Commonwealth and Allied producing territories.

Contracts to purchase were made with urban governments, who passed on the responsibility of action to administering authorities in the Pacific.

The price of copra was fixed, with a ten per cent. margin for a rise or fall in value in each successive year. This annual price-fixing was done by negotia-

[1] Except where pearl or trochus shell fishing is undertaken, nearly all coral atoll islands are entirely dependent upon copra as a source of income.

A grove of Malayan dwarf palms planted in 1939 on Vailele Plantation, Western Samoa. These heavily-bearing palms were planted 22 feet by 22 feet apart, and their yield has been computed to be just over a ton to the acre.

tion between the London Ministry of Food and governments controlling island administrations. They in turn were advised by Copra Boards established in many of the island groups.

Each year's price negotiations were based upon the open market value of copra during the preceding year. These annual adjustments in a long-term contract ensured a profitable return for shippers, and nine years' security for the coconut planters.

Notwithstanding this good fortune, the planters have been unable to forget the misery of the depression years, and have not yet regained confidence in the market's future. On every hand throughout the islands one has heard the remark, "When the M.O.F. contract expires, what then?"

Again, because the various Copra Boards set up by the island governments to handle the purchase and shipment of local copra accumulations invariably numbered planters among their members, the same question of "What then?" has coloured their outlook.

Administration emphasis for some years has been directed by Copra Board influence upon the future disposal of copra after the present contract expires, rather than upon a direct interest in maintaining future levels of production by encouraging the extensive planting of coconuts.

Paradoxically, however, this insistence upon first making long-term arrangements for the profitable marketing of copra is a sure way to promote planting confidence and, if market stability can be established, the urge to plant new areas under coconuts and to re-plant worn out estates will follow automatically.

That a guaranteed price for copra over a term of years along the lines of the M.O.F. contract will promote the desire to plant coconuts is undeniable, but, apart from public companies and a relatively small number of wealthy private planters, the capital outlay involved in the establishment of several hundred acres of coconuts to-day may well discourage intending planters.

The island coconut palm, in all its many varieties, is the palm which grows to a height of fifty or sixty feet before it dies. It takes up to fifteen years for such a palm to achieve its maximum production. A small crop may be expected when the palm is between six and eight years old, but even up to the sixth year the coconut planter's capital outlay, including ordinary living expenses, is likely to be heavy.

Planting For Quickest Returns

Apart from direct financial assistance, there are some suggestions which can be made for ameliorating the planter's financial burden, which may be worth considering. These are:—

(a) The planting of Malayan dwarf coconuts, from which returns may be expected within four or five years.

(b) The interplanting of bananas (temporary) or cocoa (permanent) within and between the rows of young coconut palms to provide early income.

Unfortunately it is generally in those territories where private income and public revenue is derived only from copra that secondary crops, such as bananas or cocoa, cannot be grown. Unsuitable soil conditions or high winds, or the lack of a market or suitable marketing facilities in the case of bananas, may operate against their establishment.

Where this is so, the planting of the orange Malayan dwarf coconut can be recommended for yield and early-bearing qualities. This palm is so-called from the bright orange colour of the nuts it bears, as opposed to the green variety of Malayan dwarf palms.

H. F. Macmillan, in his publication, *Tropical Planting and Gardening*, refers to the dwarf coconut, "Nyiur-gading" of Malaya, which bears fruit when about 4-5 years old, and when the stem is only two or three feet high. "The nuts," Macmillan states, "are small but numerous."

The tall palm is sometimes the only variety grown locally from which seed nuts are available in quantity to planters. The dwarf palms, however, have been introduced into many Pacific islands but in many cases the varieties, where grown, have not been properly segregated to prevent inter-pollination with local palms, and the seed is likely to be hybridised.

If the Malayan dwarf palm can be obtained in its pure form from a Department of Agriculture, or other reliable source, it can be recommended to give the planter a much earlier return on his capital investment than the tall palm.

Green coconut meat cut from a dwarf nut is approximately 2/3rds the weight of meat taken from a full-sized palm nut. On the other hand the yield from the former is heavy and, being dwarfed, the palms can be planted closer in the field, usually 22' x 22' apart, or ninety trees to the acre. The average yield is therefore greater than the yield from an acre of tall palms, which are usually planted 30' x 30' apart, or forty-eight trees to the acre.

The dwarf palm does not thrive in all localities where the hardier island palm will grow. Caution should, therefore, be exercised before planting the dwarf extensively, and reference should be made to the nearest agricultural officer for advice.

The inexperienced planter should be careful to see that the "King" drinking nut is not planted in mistake for the Malayan dwarf. This is also an orange dwarf coconut, but it is used as an ornamental nut and for drinking, and contains very little kernel from which copra may be made.

Bananas A Good Catch Crop

Bananas may be grown as a catch

crop in good virgin soil protected from high winds. The stands are planted out as suckers or corms, which should be obtained from a disease-free source, and from marketable varieties. There are literally dozens of species of edible bananas in the tropics, but not all of these are good carrying varieties. Some have characteristics which make them unpopular for general marketing, and the advice of the local agricultural officer or banana scheme inspectors should be sought before the planter obtains his suckers.

When used as a catch crop, banana plants are generally spaced ten feet apart between the rows of young coconuts. They may be expected to come into bearing nine months after planting.

In groups where a government or a co-operative banana scheme operates, the returns from the sale of bananas should provide an adequate income for the grower as his coconuts advance towards maturity. Where no organised scheme for marketing exists, however, the grower could possibly find great difficulty in arranging for the continuous sale of his fruit.

It should be mentioned, too, that the banana plant is a fairly heavy feeder upon soil nutrients, and it is considered inadvisable to grow them together with a permanent crop for a period longer than four years.

The palm nearest to the camera is a hybrid, orange Malayan dwarf imported selected Malayan tall palm. Notwithstanding the hybridisation, it bore coconuts in its fourth year. Taken on Vailele plantation, Western Samoa.

Cocoa A Good Alternative

Cocoa will usually thrive where bananas grow readily, and cocoa beans are without the same marketing problems when their quality is good.

Although cocoa is sometimes loosely described as a secondary crop, as a tree it is as permanent as a coconut palm, though subject to more diseases. Like the coconut, and under ideal conditions, its life span can be as long as a hundred years. I have seen cocoa in Central America which, I was informed, had been planted more than a hundred years ago.

In a suitable soil, and with freedom from high winds, cocoa may be planted between rows of coconut palms, and be co-husbanded with them permanently. Since it bears a small first crop in the third year, income from such a source would relieve the coconut planter in his long wait for returns.

There is abundant proof that cocoa and coconuts are entirely compatible, and that the co-husbanding of the two crops does not cause deterioration of soil fertility at a greater rate than if one or the other were grown singly. Cocoa will certainly use up available nitrogen in a soil rapidly, but legumes may be grown to supply the deficiency. It has been found, too, that the tall coconut palms, when spaced 30' x 30' apart, cast just the right amount of shade for optimum growth and yield from the cocoa trees.

The planter who decides to grow cocoa with his coconuts would gain advantages in many ways. He would receive an early return from his capital outlay and, when both crops reached maturity, he would gain two incomes from the same area. The cocoa, when fully mature, would possess a good canopy of shade which would restrict the growth of weeds and grass, and so make the harvesting of fallen coconuts an easy task. At the same time weeding or slashing costs would be reduced to a minimum.

At this point I should warn readers that prices for cocoa are unlikely to return to the peak prices of 1953-54 in the foreseeable future. *The Australian Financial Review* of March 14, 1957, states, *inter alia*:—

> "Both in London and in the United States purchases of cocoa continue to run ahead of sales as marketing boards add to their stocks. With prices now at their lowest for seven years, world consumption, though largely recovered, still lags behind current production . . . Consumption in 1957 is expected to be higher than ever, but will not even touch the vast surplus."

Since 1954, world prices for cocoa have continued to decline, but world production has increased from around 730,000 tons to nearly 850,000 tons annually. The vast African plantings are still being increased, and their products will swell the surplus.

Cattle Another Alternative

This rather sombre picture of possible trends has been relieved recently by the action of the Brazilian Cocoa Marketing Board, which decided to increase its stockpiling, and by reducing tonnage marketed, control prices at higher levels. The concurrent efforts of the Brazilian and West African Cocoa Marketing Boards which jointly control a large proportion of the world's cocoa production may continue to have the effect of stabilizing prices at current levels.

Lowered prices may deter cocoa planting on its own, but as a secondary or co-husbanded crop with coconuts, its value for shading out undergrowth and reducing coconut harvesting costs, to say nothing of the second income to be derived from the sale of cocoa beans, cannot be lightly dismissed.

As an alternative to cocoa growing, planters may consider grazing cattle under their coconuts to keep in check the weeds and long grass. In my opinion, the planter should satisfy himself first that there is a good local market for

Eighteen-year-old orange dwarf coconut palms with a background of the common tall palm. Progeny resulting from planting the dwarf nuts from the foreground trees are likely to be hybridised because of their proximity to the tall variety.

beef before putting such a plan into operation. Cattle tend to pack or compress the soil around coconuts, and authorities agree that palm yield is adversely affected. Unless beef sales can compensate the grower for the loss in harvest, cattle raising in the coconut areas appears inadvisable.

Space does not permit the inclusion of hints for planting either cocoa or bananas, and the object of the foregoing is to suggest ways and means for lightening the burden of financing coconut planting during the early unproductive years. For details the intending planter should refer to some of the many sound text-books which have been written on both cocoa and bananas.

In many territories the indigenous inhabitants, through progress brought about by education, have become interested in farming their lands by modern methods and on more extensive scales than in the past. It is true that some of these planters will rely upon members of their family groups to supply the labour for working their holdings and so reduce capital expenditure, but buildings and driers, and in some cases the means of transport, will require a capital outlay beyond the average means.

In places where communal forms of land-holding and farming obtain, the small holders will require co-operative copra driers. These should be capable of being easily constructed from materials available locally and easily run, and relied upon to turn out good quality, hot-air-dried copra. Where sun-drying is common practice, the frustrations and wastage caused by long spells of wet weather can only be overcome by the use of hot-air driers.

Insistence by crushers upon better-quality copra will promote the payment of premiums for superior grades and, if native farmers are to share in those benefits, they will have to be given opportunities for the production of better quality copra.

The erection and use of co-operative driers would no doubt become an administrative responsibility for a co-operative's officer to handle, both as to finance and as to the proper supervision of the drier's working and maintenance.

Since a large proprtion of copra exported from all the islands is of native origin, their encouragement towards planting more coconuts is of paramount importance, and the provision of means to produce high quality copra, which will return them premium prices, must surely be one means to that end.

The changing pattern of island life demands the development of whatever industries there are to be fostered. With the education and development of the indigenous people will come a desire for greater incomes to meet higher living standards. In many island groups only the coconut will thrive and produce an export of value.

Finance, other than for hot-air kilns, is not a native necessity because they, or the family group to which they belong, invariably possess land, and they have family members who assist in its planting and maintenance.

On the other hand, private planters both great and small may require financial assistance if catch crops cannot be grown and if they are to be encouraged in the planting of coconuts.

If commercial interests cannot be found to act as their bankers, then only the governing body of the territory, through its Copra Board or Department of Agriculture, may be in a position to grant planters the necessary capital backing. Equal facilities should be extended to the planter of extensive areas and to the small farmer because they will all create revenue for the territory in which they operate.

As a means for discouraging irresponsibles, financial aid need not be extended until after the conclusion of the first year's planting. At the end of twelve months the planters who apply for capital assistance could have the value of their improvements assessed by a competent authority. Advances could then be made up to the value of the assessment, or even beyond it, if buildings were required and deemed to be necessary. Securities could be given in the form of mortgages or liens on future crops, or both.

Re-payment could be effected by taking a percentage of the value of each delivery of copra after the planter's coconuts commenced to bear. These monies could be deducted by the Copra Board or appointed agents.

Governments are at present negotiating long-term contracts for the sale and shipment of copra to oil mills. It is not unlikely that these will be along the lines of the M.O.F. agreements which expired at the end of last year.

If the new contracts can be satisfactorily concluded at price levels which will ensure the planter a fair margin of profit for his product, then a decisive step towards a new coconut planting era will have been taken.

Music Of The South Seas

The South Pacific Commission maintains a lending library of recordings of traditional music of the South Seas. Island radio stations can borrow or purchase, for broadcasting in their own programmes, the recordings listed in the catalogue that has been issued. Over ninety have been collected so far, from Papua and New Guinea, British Solomon Islands, American and Western Samoa, Cook Islands and the Gilbert and Ellice Group. While most are of music, some are of traditional ceremonies and dances.

Commissioners, advisers and principal officers of the Secretariat who attended the seventeenth session. Left to right, front row: Mr. J. S. Rennie, U.K.; Mr. J. A. van Beuge, Netherlands; Dean Knowles A. Ryerson, U.S.A.; Dr. Ralph Clairon Bedell (Secretary-General); Mr. C. G. R. McKay, N.Z. (Chairman); Mr. J. R. Halligan, Australia; M. R. Pons, France. Middle row: Mr. H. H. Vaskess, U.K.; Mr. A. O. Dare, N.Z.; Dr. Arthur S. Osborne, U.S.A.; Dr. Th. P. Bergsma, Netherlands; Sir John Collins, Australia; The Honorable Peter T. Coleman, U.S.A.; Dr. A. H. J. Kroon (Executive Officer for Economic Development). Back row: Dr. A. Loosjes, Netherlands; Mr. P. K. Edmonds, N.Z.; Mr. C. H. Cox, Australia; Mr. R. A. Peachey, Australia; Dr. E. Massal (Executive Officer for Health); Dr. R. Seddon (Executive Officer for Social Development); Mr. Robert G. Shackleton, U.S.A. (Absent: M. R. Labsalle-Sere, France; Sir John Gutch, U.K.; Miss Edna H. Barr, U.S.A.; Dr. J. R. Cumpston, Australia.)

Commission Holds Seventeenth Session

Progress made during 1957 by the South Pacific Commission in its fields of activity was reviewed, and plans for the 1958 work programme were finalized at the seventeenth session.

THE seventeenth session of the South Pacific Commission was held at its headquarters in Nouméa from October 19 to November 6 last. Representatives attended from Australia, France, the Netherlands, New Zealand, United Kingdom and United States. Chairman for the meeting was the Senior Commissioner for New Zealand, Mr. C. G. R. McKay.

The Commission decided it will concentrate on a limited number of activities with clearly-defined objectives of practical value to the sixteen Pacific territories it serves. Where possible, it will work on projects in active partnership with island administrations. In its work, it will seek increasing aid from other international organizations and bodies interested in Pacific progress.

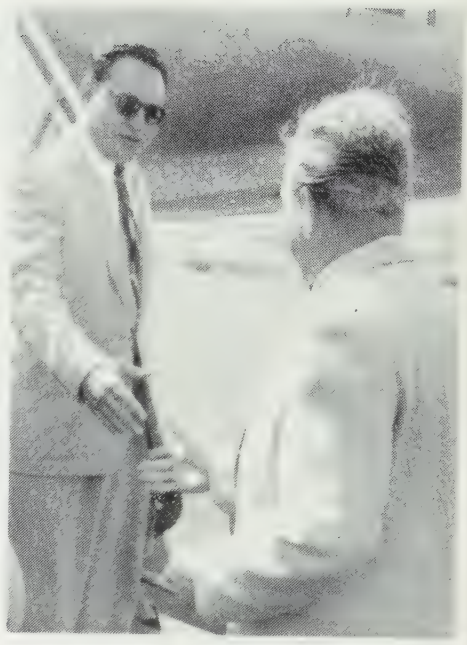
The Commission will thus be giving effect to the conclusions of the Review Conference held by its member nations in Canberra last May to study its first ten years of progress, and to suggest broad lines for its future work.

At the recent session specific subjects for concentrated effort were selected in the Commission's three main fields of activity. In economic development these are fisheries, pests and diseases of plants and animals (especially the rhinoceros beetle), and plant introduction. In the health field, health education, nutrition and diet, and mosquito-borne diseases were selected, while in social development, effort will be concentrated on literature promotion, education, and aided self-help.

Training Courses For Pacific Islanders

Since it last met in October 1956 the Commission has successfully tested a new method of working, by training Pacific islanders in practical ways of helping their own peoples. Special courses in fisheries and health education have been held at Commission headquarters. Twenty-five islanders from fourteen territories attended a thirteen-week fisheries course, and thirty-nine trainees from fifteen territories an eight-week health education course.

At the recent session the Commission expressed satisfaction at the success of both courses, and its appreciation for the



Session arrivals at Noumea's airport. Left: Mr. C. G. R. McKay, Senior Commissioner for New Zealand, who was chairman of the [illegible]eenth session. Right: The Secretary-General of the South Pacific Commission, Dr. Ralph Clairon Bedell, greets the Hon. Peter T. Coleman, Samoan-born Governor of American Samoa, who was Alternate Commissioner for the United States.

valuable assistance given by the respective co-sponsoring bodies—the Food and Agriculture Organization and the World Health Organization.

The Commission also approved preliminary proposals for the holding of two further training courses for Pacific islanders, one in boat building, repairs, and engine maintenance, the other in literature production. The Commission will again seek the help of appropriate international bodies in staging both courses, which it has been invited to hold in the British Solomon Islands.

Fisheries Programme

During 1958 the experimental fish ponds project will be expanded, and a committee on fisheries will be set up to advise the Commission on technical matters. Otherwise the Commission's work for developing fisheries in the region will continue along present lines under the direction of the fisheries officer, Mr. H. van Pel. Special efforts will be made to maintain follow-up contacts with the students who attended the fisheries course held at Commission headquarters from November 19 1956 to February 22 1957.

Rhinoceros Beetle Control

Early in 1957 a Commission entomologist, Dr. C. P. Hoyt, spent several months in Madagascar searching for a likely predator to attack the rhinoceros beetle, which each year causes serious losses to the coconut crops of many Pacific islands. He found a carabid beetle that feeds on the larvae of the rhinoceros beetle. Two batches have arrived in Fiji, and have been liberated on the island of Viti Levu, where a major rhinoceros beetle infestation, discovered in 1953, has been steadily spreading since, despite all attempts to control it. A third batch of predators has been released on Wallis Island.

A second entomologist working in South-East Asia, Dr. P. Surany, has found several diseases of the rhinoceros beetle, two of which appear promising for biological control. Dr. Surany is now continuing his investigations in East Africa.

In 1958 the Commission will employ an expanded team of investigators on this project, if support can be obtained from other international bodies or from territorial governments specially interested in the problem.

Plant Introduction Activities

Work in this field is being concentrated on the introduction and distribution in the region of cocoa, coffee, pepper, other cash crops, root and green vegetables, breadfruit, bamboo, and forage and pasture plants.

The Commission's newly-appointed plant introduction officer, Dr. J. Barrau, is keeping in close touch with administrations and the main introduction and quarantine stations in the region, and is arranging distribution for introduced plants.

The Commission approved a contribution to the plant introduction station at Naduruloulou, near Suva, Fiji, in recognition of the useful work being carried out there on cocoa, coffee, black pepper, and taro.

Health Education

The Commission reviewed progress made in the health education project, including the holding of the health education training course at headquarters from July 1 to August 21 1957. The services of an international health education specialist, Dr. A. L. Scherzer, who was an instructor at the course, have been loaned to the Commission by the World Health Organization for follow-up work. Dr. Scherzer has begun visits to territories to give students who attended the course any help they may need. As required, he is also working with territorial officials on their own health education programmes.

Mosquito-Borne Diseases

Since the Commission met in October 1956, its specialist in mosquito-borne diseases, Dr. M. O. T. Iyengar, has visited the Cook Islands and Niue. He advised on their special problems of mosquito control.

The Commission approved in principle the holding of a study group in 1959 or 1960 to review the progress made in the field of filariasis and elephantiasis since the Filariasis Conference was held under Commission auspices in Tahiti in 1951.

Pacific Co-operatives

A technical meeting on co-operatives will be held under Commission auspices at Port Moresby next July or August to enable officers of territorial administrations and specialist co-operative officers to discuss their problems and exchange views and experiences. The value of co-operatives in territorial development and techniques for setting them up will be studied, as will the possible role the Commission can play in fostering co-operative development in the region.

During 1957 the Commission's co-operatives officer, Mr. C. G. Joannides, visited a number of territories needing assistance in co-operative matters. In each he worked with local officers giving on-the-spot advice and demonstrations. Territories so visited were the Gilbert and Ellice Islands, Solomons, Netherlands New Guinea, Papua and New Guinea, Guam, Trust Territory of the Pacific Islands, and the Cook Islands.

S.P.C. Literature Bureau

The Commission approved preliminary plans to set up a literature production training centre for Pacific islanders, probably in Honiara in the British Solomon

(Continued on page 62)

Cyclone Prediction In The Coral Sea

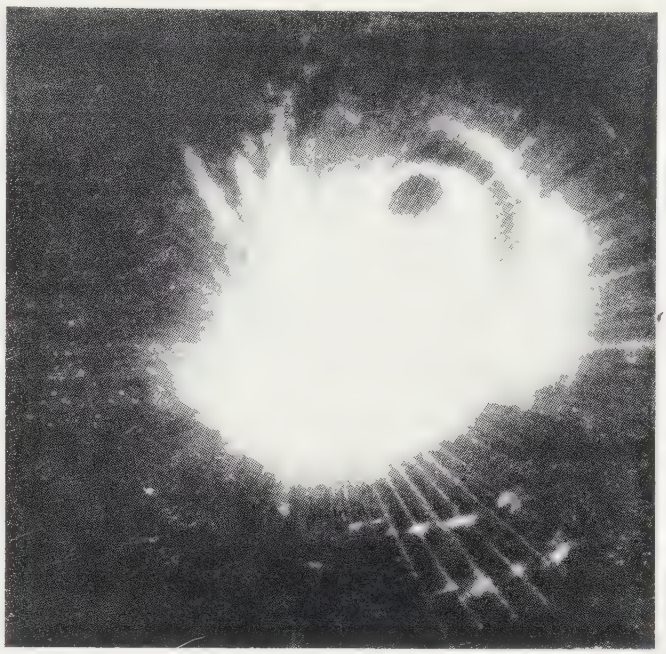


Fig. 1.—A cyclone as it appears on a radar screen. The white parts are cloud formations. The "eye" of the cyclone is clearly visible. The distance from the "eye" to the radar station (centre of the photograph) is thirty-seven miles.

With the coming of the cyclone season each summer, meteorologists in the south-west Pacific become aware of the serious paucity of meteorological observations in the Coral Sea, that vast expanse of ocean extending over more than one million square miles (approximately four times the size of France). In the article below, the authors, after making a few general observations on tropical cyclones and the means for detecting them, discuss the features of the 1956-1957 cyclone season in the Coral Sea, and the difficulties in weather-forecasting then experienced.

By J. GIOVANNELLI and J. ROBERT*

TROPICAL cyclones are atmospherical disturbances of great violence which are formed at sea during the summer months; they develop from a closed tropical depression which starts a gyratory movement, and they usually originate between the Equator and the 15th parallel.[1]

The diameter of these violent whirlwinds which near the centre often attain gale, and even hurricane, force, is variable. It increases as they develop: from twenty miles or so at the beginning, it can extend to anything between 250 and 700 miles.

The centre of the cyclone, called "the eye of the storm", is a relatively calm area, but immediately around it are enormous and tempestuous banks of clouds accompanied by torrential rains. In most cases these are localized in front of the centre, though this phenomenon is not sufficiently general for it to provide any real value in weather forecasting.

Atmospheric pressure in the centre of the vortex is very low. The barometer frequently drops below 990 millibars (743 mm.) and may sometimes go down to 945 millibars (708 mm.). In some extreme cases pressures below 900 millibars (675 mm.) and wind velocities above 155 miles an hour have been recorded.

To detect the formation and/or the existence of a tropical cyclone, most National Weather Bureaux normally use observations received from surface stations, ships and planes, aerological soundings, and *radiosonde* observations. The last give a comprehensive picture of the atmosphere by recording temperature, pressure and humidity from ground level right up to 60,000 feet and sometimes above. All this information is transmitted by radio several times a day, at set times. Thus each Weather Bureau is able with the minimum of delay to plot this data on charts, upon which the weather forecaster's "diagnosis" is based.

Apart from the traditional methods described above there are others, more modern, though unfortunately they require very expensive equipment and highly-trained personnel. These comprise study of the echo reproduced on the radar screen; location and observation of the cyclone by specially-equipped meteorological flights; study of the variations in magnitude of micro-seismic activity, as this is sometimes violently disturbed by cyclones; goniometry of radio-electric interference caused by the cyclone; and telephotography, by means of stratosphere rockets, of areas not covered by surface stations.

Movement Of Tropical Cyclones

The primary causes of the formation of a tropical cyclone are to be found in the upper troposphere.

However, given a reasonable network of stations providing good synoptic ob- [illegible] experienced meteorologist is soon able to detect a cyclone as he is drawing up his chart. He is also in the position to locate the centre fairly accur- [illegible] barometric pressure at that spot, and the velocity of the wind [illegible]

Fig. 2.—[illegible] variations in micro- [illegible] am February 10 to 13 19[illegible]

* M. Giovannelli is Chief Meteorological Officer, and M. Robert, Meteorologist, of the Meteorological Service of New Caledonia.

[1] The term "tropical cyclone", as agreed by the World Meteorological Organization, applies to any closed low pressure system giving rise to winds the velocity of which exceeds 64 knots (75 miles per hour). The term "tropical storm" is used when the wind velocity remains below that limit. In the "storm area" the wind velocity exceeds 40 knots (46 miles per hour).

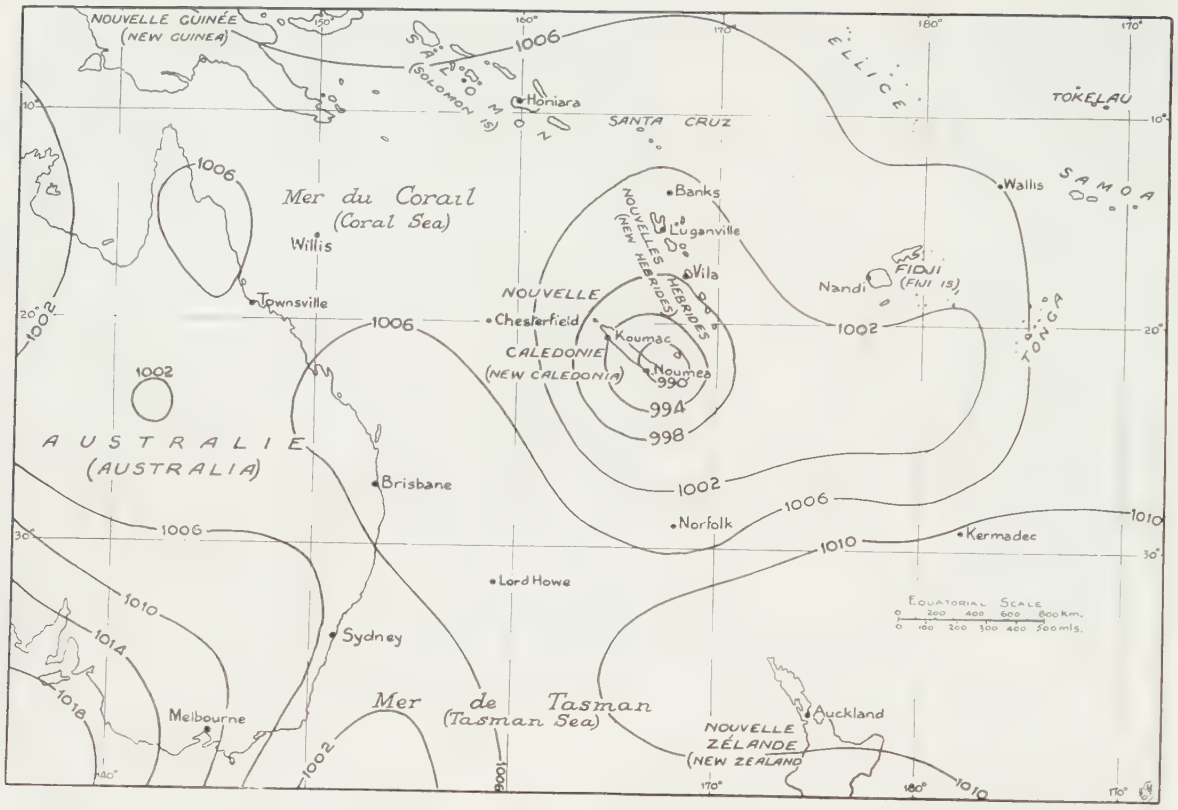


Fig. 3. — Isobaric map for January 6 1957. 1800 hours G.M.T. (The isobaric maps on this and the page opposite were prepared from originals supplied by the authors.)

It is more difficult to predict the speed and the direction in which the depression will move.

Generally speaking, to forecast the course of a cyclone, the meteorologist proceeds by extrapolation of what is already known of its trajectory, taking into account the general isobaric map and the air current generated, which is like a mighty stream carrying the vortex. The problem would still remain fairly simple if the enormous turmoil within the whirl did not create other currents which add confusion to the whole pattern. One is then faced with totally unexpected counter-whirls and re-curvings, so that more often than not the trajectory of the centre bears very little resemblance to the parabola theoretically ascribed to tropical cyclones.

To sum up, it is possible to detect a tropical cyclone with the help of surface observations only, but these are quite insufficient to enable us to forecast the trajectory of the phenomenon. As in the case of the primary causes, it is the upper troposphere which yields the information enabling us to predict the course of a tropical cyclone and, even more so, the deviations from that course. Unfortunately the cost of such an undertaking is enormous.

Cyclones Over The Coral Sea

If one scans, even idly, the meteorological map of the south-west Pacific, one is immediately aware of a great blank space: the Coral Sea. Almost circular in shape, it has a diameter of roughly 1300 miles.

There are no meteorological stations and no regular shipping routes or airlines within this area. This vast expanse of ocean is therefore a constant source of anxiety to the meteorologist who, in order to try to imagine what is going on there, must follow with the utmost care the smallest variation and the slightest anomaly in observations recorded by stations on the fringe of the area: Australia to the west, New Guinea and the Solomons to the north, the New Hebrides to the east and New Caledonia to the south-east.

Means at our disposal are scant to keep watch over such a large area, and unfortunately it does not appear possible to appreciably increase them. The setting-up in the near future of *radiosonde* stations at Nouméa and Honiara will greatly improve our system of investigation, as information from these stations will complement that received from Brisbane and Townsville.

In another connection, co-operation is developing between meteorologists and geophysicians in various countries in the study of the variations in micro-seismic activity. Certain well-determined facts tend to make us believe that, in this field, we may discover an extra means of obtaining valuable information.

In accordance with principles laid down by the World Meteorological Organization, a simple and effective system for the exchange of storm warnings has been evolved in our part of the world. As soon as a meteorological station is virtually certain that there is a cyclone within its allocated area the information is immediately conveyed to all other stations in the Pacific and south-east Asia. The development of each phase of the storm is closely watched and special bulletins are broadcast at regular intervals by the station concerned, which also warns the population in the danger zone. As soon as the disturbance has moved into the next area the neighbouring station takes over and broadcasts the necessary forecasts and information.

Destructive, or well-developed, cyclones are rare in the south-west Pacific. But this region is the scene of more disturbances than are generally credited, and the material results of these whirlwinds—however small their diameter and duration—are nevertheless of importance, for they do constitute a serious danger to shipping and airliners. These storms are difficult to detect because they take place in an area where meteorological observations are sparsely spread out over a vast expanse of ocean.

Cyclone Season In The Coral Sea

Having regard to the necessary and favourable conditions for the formation of a cyclone it is generally accepted that in our area the "cyclone season" lasts from mid-December to mid-April. Exceptionally it may be a week or two earlier or later.

Storms, sometimes very violent, are recorded at other times of the year. However, their cause is entirely different and besides, they are not vortex-shaped.

According to Mr. J. F. Gabites the seasonal average number of cyclones is

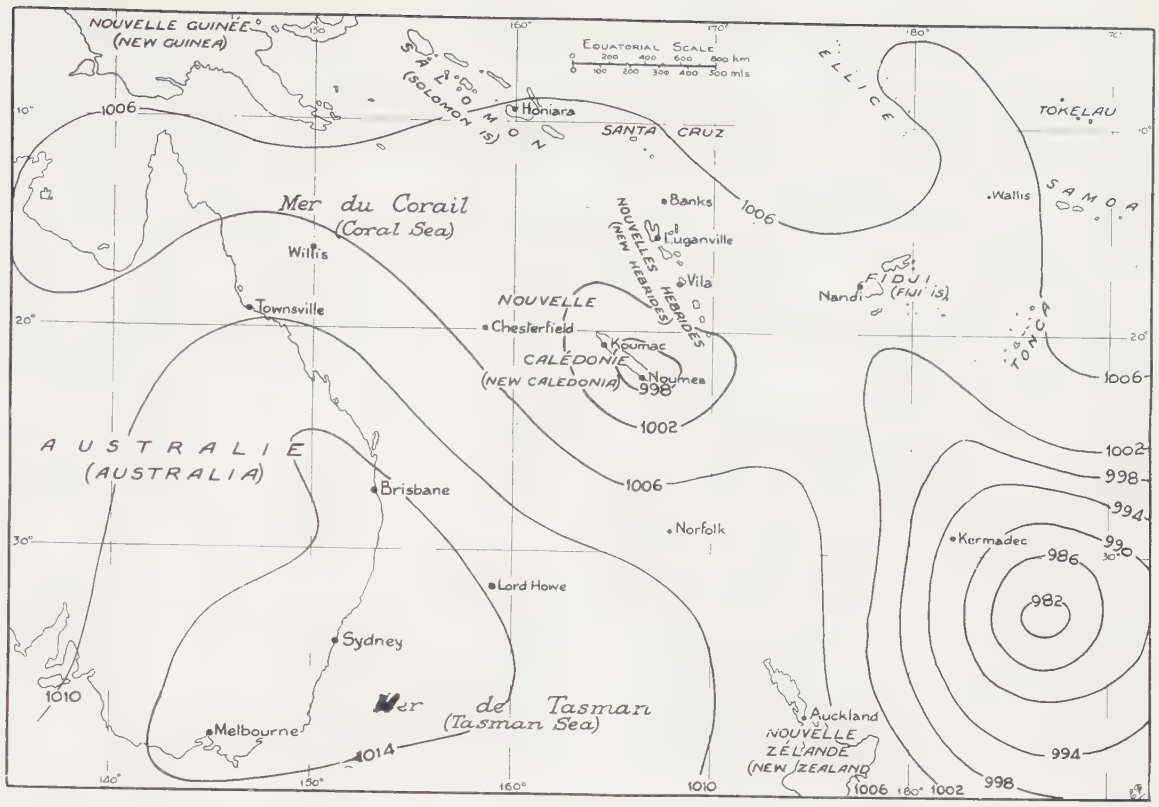


Fig. 4. — Isobaric map for January 12 1957. 0000 hours G.M.T. The strong depression visible in the south-east quarter is that appearing over New Caledonia on the map for January 6 (opposite).

4, with a maximum of 9 in 1955-56 and a minimum of 0 in 1944-45. The studies of Mr. Gabites extend over a period of seventeen years, and cover not only the Coral Sea but the whole of the south-west Pacific. The figures given refer to cyclones which were detected on meteorological charts. Undoubtedly there must have been more, as some disturbances follow a course which never comes within the reach of meteorological survey.

Mentioned below are only those cyclones which developed during the 1956-57 season over the Coral Sea; those which affected the Fiji area, the York Peninsula and the Gulf of Carpentaria have purposely been omitted.

The Cyclone Season 1956-57

Cyclonic activity was recorded during the following periods:

DECEMBER 4 TO 8, 1956: A ridge of low pressure, moving slowly eastwards, spread during this period from the Willis Group to an area south-west of Norfolk. Small, ill-defined depressions kept on forming along the ridge, developed partially, and moved on. There is no evidence that any of these depressions ever reached cyclone dimensions; it is certain, however, that this ridge coincided with an area of extreme bad weather and the formation of small, rapidly-developing whirlwinds.

The pilot of Qantas aircraft VHEBN, flying from Sydney to Nouméa on the morning of December 7, ran into bad weather such as he had never experienced in fifteen years of flying over the Pacific. After a rather longer stop than usual at Nouméa he took off again for Sydney, making a north-westerly detour which enabled him to by-pass most of the storm. This shows how very localized were all the phenomena which developed during the period.

JANUARY 4 TO 7, 1957: Originating near the Willis Islands, a small depression moved over the Coral Sea, gradually increasing in intensity. It reached New Caledonia on January 6, made its way across the island very rapidly from Bourail to Thio, passed south of Maré and disappeared towards the south-west, where it caused a widespread and very violent storm in the Kermadec area.

JANUARY 10 TO 14, 1957: Another small depression followed the track of the preceding one; it hit New Caledonia at the same place on January 12. It appears to have reached its maximum intensity in the Chesterfield area, then gradually decreased, vanishing somewhere south-east of Fiji.

While over the Coral Sea these two depressions were of mild intensity. The term "cyclone" can be applied to the first depression during the last phase of its existence.

FEBRUARY 2 TO 20, 1957: On February 2 there originated, north of the Willis Group, one of the most violent cyclones which in the memory of man ever affected that region. The lowest pressure recorded was 953.8 millibars, but it is probable that a much lower pressure prevailed at times at the centre. For over a fortnight the wind blew in gusts sometimes exceeding 140 miles an hour. The cyclone caused torrential rains and, during the first week of its existence, laid waste the north coast of Queensland.

From February 2 to 10 it travelled to and fro off the coast, then moved slowly over the Coral Sea. It reached a point north-west of the Chesterfields on the 14th, and after a few waverings moved south. With increased velocity the cyclone then moved west and hit New South Wales near Port Macquarie on the 18th. Its intensity, which was waning after the 15th, then decreased rapidly over the land, and it vanished north of Melbourne on the 20th.

MARCH 28 TO 30, 1957: On March 27 we were on the alert, as all meteorological signs seemed to point to the formation of a cyclone over the eastern half of the Coral Sea. Then on the morning of March 30 we received a signal from the oceanographic ship *Orsom III* belonging to the French Institute of Oceania, stating—very briefly because of the difficulty of transmission—that she was in a raging storm forty miles off the south-west coast of Aneityum in the New Hebrides. Pressure was down to 986 millibars. According to our information the lowest pressure recorded at the time was 1002 millibars at Erromango and in the Loyalty Islands. We dismissed the figure quoted by *Orsom III* as an error in transmission due to bad weather but called Vila to obtain an immediate ob-

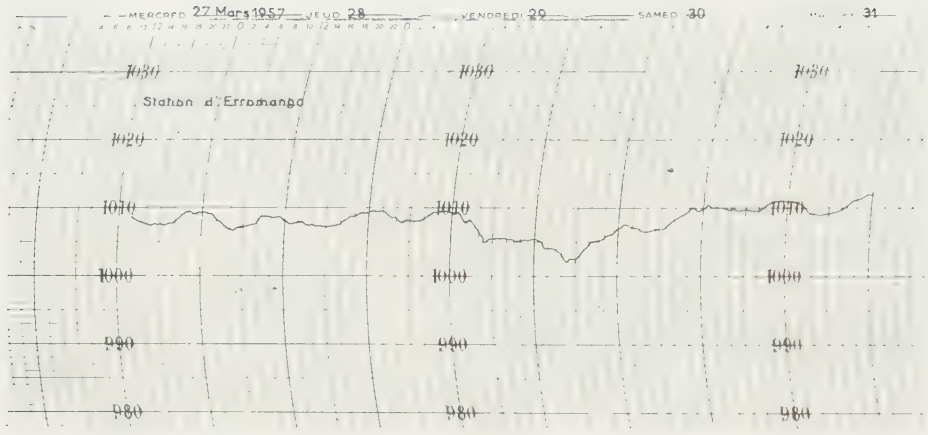
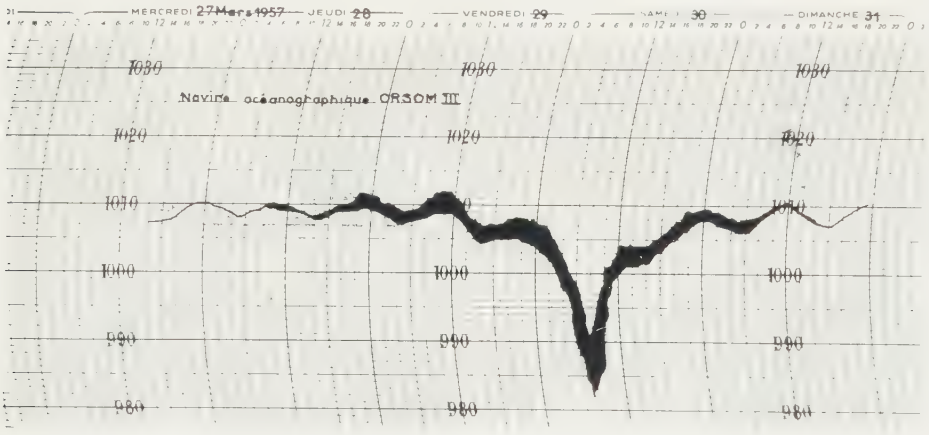


Fig. 5.—Barographs recorded at Erromango in the New Hebrides (above) and on board the French research ship "Orsom III" (below) from March 27 to 31 1957. The thickness of the line on the "Orsom III" barograph was caused by the tossing of the ship in the small but violent cyclone she encountered on March 30.



servation from Aneityum: less than an hour later the signal from *Orsom III* was confirmed.

Since then we have discussed the matter with Mr. Criou, Captain of the vessel, and Mr. Legand, oceanographer. There can be no possible doubt that a localized but violent cyclone raged around Aneityum on that day. No other ship or aircraft encountered the disturbance. One can only surmize that the cyclone originated in the Coral Sea immediately south of the Solomon Islands, travelled very rapidly in a south-easterly direction half-way between the Loyalty Islands and the New Hebrides, hit only the southernmost tip of that Group, and vanished at sea somewhere south-east or south of Fiji.

Forecasting These Phenomena

A plain survey of the disturbances which occurred last summer and their brief description show how varied they were. They can be divided as follows:

The Big February Depression: Because of its magnitude and the scale of damage it wrought, this depression is worthy of the name "destructive tropical cyclone".

Its existence was detected almost immediately, but its course could not be forecast although, during the first few days, its position could be plotted fairly accurately. This was a case where the magnitude of the phenomena was such that it caused major and unexpected disturbances in the general airflow.

The various meteorological services called upon to report on this cyclone were considerably hampered by the lack of any information on the troposphere in this area. All they could do was to broadcast, as often as possible, special hurricane warnings indicating the last known position of the centre of the disturbance.

The similarity of the barographs recorded in Koumac and Nouméa, in spite of a distance of approximately 250 miles between the two stations, shows that the effects of the cyclone were pretty well evenly distributed all over New Caledonia; this is proof of the enormous range covered by the disturbance. Finally, it is worth while mentioning that in spite of the fact that pressure recorded in Koumac was as low as 986 millibars, the active part of the cyclone was quite remote, and the island was not affected by the centre of the disturbance.

The Two January Depressions: Of these two depressions only the first one, in its last phase, reached the magnitude of a cyclone, or rather of a violent storm of the middle latitudes. The whirl of the second was "smothered" by the countercurrent of the first. Without any appreciable detour they both followed the general airflow, and as they had been detected at birth, the forecasts given on them were satisfactory.

The Cyclonic Status In December And March: In both cases we estimated the prevailing conditions to be pre-cyclonic. However, not one fact entitles us to state that any cyclone, however small and short-lived, developed in December. In March, only the observations made aboard *Orsom III* and at Aneityum enabled us to detect one disturbance and then only briefly and during a few hours of its existence.

The barographs of *Orsom III* and Erromango, although recorded closer together, geographically, than those of Koumac and Nouméa, emphasize the essential difference between the disturbances of February and March. Erromango recorded only the smallest drop in pressure, whereas on board *Orsom III* the drop describes a spectacular "V" shape. This example illustrates in full how difficult it is for us, with only the traditional means at our disposal, to be certain of the existence of such phenomena hundreds of miles away.

Conclusion

This brief account illustrates the difficulties which face us in trying to solve this most complex problem—the forecasting of cyclones in this part of the world.

All the meteorologists in tropical and equatorial regions are faced with the same problems which come on the one hand from the paucity of research means at our disposal and on the other from the diversity, the peculiar nature and the suddenness of the phenomena concerned. Between the tropics, the physicist of the atmosphere is only too often in the position of a doctor who would have to diagnose an illness before it has started. Once started, the development and the end of the disturbance are so violent and so sudden that the part played by the meteorologist is merely that of a witness.

However, considerable knowledge of the general meteorological system in the south-western Pacific, past experience and prompt exchange of information between the several Bureaux do enable us, with only the observations made at stations on the outskirts of the Coral Sea, to pinpoint the existence of a depression centre or to detect any conditions favourable to the birth of a cyclone.

We are, however, then faced with other problems which often remain unsolved while the depression travels over the Coral Sea, such as lack of information about the characteristics of the

(Continued on page 45)

Community Development In The Nimboran

In 1952, a Commission-assisted community development project was launched in the Nimboran region of Netherlands New Guinea under the supervision of District Officer W. J. Kouwenhoven, with general guidance by a supervisory board in Hollandia. The final report on the project, prepared by Dr. Kouwenhoven, was published in 1956 under the title of NIMBORAN, A STUDY OF SOCIAL CHANGE AND SOCIO-ECONOMIC DEVELOPMENT IN A NEW GUINEA SOCIETY. *This report is reviewed below by . . .*

H. BELSHAW*

A mechanized agricultural enterprise was planned as one of the community activities of the project. Here Nimboran-born tractor-driver Obed Menile is shown breaking in land with disc harrows.

THIS study, which appears to have been published privately, is a doctorial thesis by the District Officer responsible for the Nimboran demonstration project in "community development". The project was supported by the South Pacific Commission and undertaken by the Government of Netherlands New Guinea.

The Government regarded the project as an experiment from which practical knowledge might be gained about "the possibility of undertaking so-called community development projects and the consequences of such undertakings for Netherlands New Guinea". The South Pacific Commission was concerned with the acquisition of knowledge about community development techniques which might provide guidance to responsible authorities in other territories in the South Pacific area.

The author is primarily concerned with the changes in attitudes, activities and social relationships resulting from the impact of the project. He is therefore required to weave his description of the project into his anthropological assessments. This is a difficult task, and the attempt is not entirely successful; for one puts down the book at the end impressed with the author's penetration as an observer of the society, but without a very clear picture of the project. One has to search, for example, to discover the dates when the project was launched and terminated. This absence of a clear picture of the project is perhaps due to the preparation of the study as a doctorial thesis; for his anxiety to assess the socio-economic effects of particular measures leads to a great deal of repetition, which clogs the narrative.

Nevertheless as a study in social change, and an objective account of the problems involved in economic development in a primitive society, the book makes fascinating reading, and is an important case study which should prove highly suggestive to anthropologists and administrators.

The book begins with a description of Nimboran society and of the dislocating effects of the war and of post-war relations with Hollandia. The matters dealt with are handled with perception and sensitivity, and are well selected to indicate the reasons why particular objectives were decided upon, reveal the difficulties, and indicate the persistence of attitudes determining the reactions of the people.

In a short review one cannot give an adequate outline of this pre-project situation, but only illustrate by one or two matters.

The influx of goods during the American occupation, the opportunities for voluntary labour and the improvement in communications with Hollandia, opened up new horizons and impressed the people with the superiority of western technology. The improved communications also caused more frequent visits of officials, while the prohibition of feasting, some growth in education, the increased influence of the missions, the attempt to persuade the people to live in villages (now no longer necessary for purposes of defence), and the partial substitution of administrative for indigenous authority, were disturbing and led to divided loyalties, stresses and conflicts. The migration of males to Hollandia disrupted the labour pattern.

Among important factors affecting the attitudes of the people toward the project when introduced, two may be mentioned. First, the people had become accustomed to look to the Administration to solve their problems, and there was little propensity to help themselves. Second, there was a carry-over of the belief in mystical solutions not requiring effort by the people. The *kasiep*, a state of trance traditionally related to success in war and hunting, became reminiscent of cargo cults, and was translated into

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To enable a tractor and implements to be driven to their district to carry out the agricultural development programme, four hundred Nimboran people in a voluntary effort built, in five days, eight miles of corduroy road through the jungle and a bridge over a river.

the magical acquisition of the technological powers and wealth of the European.

The project, initiated in 1952 and terminated in 1954, was preceded from 1946 onwards by various measures including surveys of the possibilities of production for the Hollandia market, road work to improve the connections with Hollandia, and the establishment of a dispensary. In 1951 a survey was made to provide information more specifically required by the project. It is not very clear what particular information it was intended to obtain nor how the survey was conducted.

A major objective was to re-establish a sense of community through the efforts of the people themselves. The interrelationship between economic and social problems was recognized, each requiring for solution the support of the other, but "the creation of opportunities to earn cash and to spend it again locally, were seen as the basic needs of the people which demanded satisfaction in the first place". The need for cash was more acutely felt by the people than social improvements. Detailed planning of social aspects was considered less desirable than to meet this need "as the incentive towards social reconstruction of society should emanate from the society itself, and coercion had to be avoided at all costs". This, however, raises the question whether the problem is properly posed in terms of "coercion" since this is no more appropriate for economic than other aspects, and there may be scope for administrative guidance or assistance as distinct from coercion in the solution of both economic and "social" problems. The directives stressed the avoidance of too much personal control, and placed emphasis on voluntary self-help activities. The District Officer was given the responsibility for direction, co-ordination being provided for by a Supervisory Council presided over by the Resident of Hollandia.

The main economic approaches included the establishment of facilities (including an improved road, and the necessary buildings so that there was an intensification of government activity and expenditure), an increase in the production of cash crops for the Hollandia market (with emphasis on mechanized farming but some attention to the promotion of individual farming), the encouragement of some local industries, the development of a co-operative society both to manage the mechanized farm enterprise and provide a trading agency, and assistance in marketing the cash products.

Assessment Of Results

The report deals with these various aspects in detail, and it seems best to assess the results in the words of the author:

> "(a) A number of leading personalities had come to the fore in Nimboran who were amenable to new ideas but who experienced a strong opposition from the Nimboran on the whole, which was due to the fact that—
>
> (b) the population had not altogether abandoned its first reaction to the project, which was characterised by an attitude of inactive expectation and the persistence of their secret belief in *kasiep*, and that—
>
> (c) self interest was still the motivating force for economic effort.
>
> (d) A tendency appeared to turn one's back on Nimboran if no satisfaction was derived from one's efforts in Nimboran (unfulfilled expectations and too persisting demands for wage labour, leaving little room for independent activities).
>
> (e) A tendency had become apparent towards the forming of more or less independent nuclei of activity (the villages or groups of villages) around Genjem which itself grew into a nucleus of regional activity (Co-operative Society, Government, market, stores, recreation, educational activities, health centre).
>
> (f) The attitude towards the Co-operative Society persisted. The failure of the fulfilment of the high hopes which were cherished by the population concerning the introduction of the development project, and which was more or less expected to come with the acceptance of membership of the Society, resulted in sharp disappointment to which the ever increasing demand for labour which was exercised by the Government added considerably.
>
> (g) Changes in the economic sphere had only partly been able to influence the social side of Nimboran life. The intellectual emancipation of the Nimboran and his adaptation to changing conditions had hardly started yet.
>
> (h) Dualism in the economic effort of the Nimboran (production for private needs, strictly separated from production for the market) shows that the new economic activities had not been yet assimilated. They existed independent of, and in addition to, the traditional forms of subsistence economy. The same is also shown by money traffic in Nimboran.
>
> (i) The employment of labour by the Government had led to new problems. The Nimboran was mostly employed outside the indigenous sphere and had, consequently, become economically dependent on this form of employment which did not connect with the possible forms of employment in indigenous society."

The net overall effect in terms of the development of community is judged by the author as follows: ". . . tension grew within Nimboran society which tended towards a crisis. . . . The situation at the end of 1954, was unstable and might easily—but not necessarily—lead to severe repercussions within Nimboran society."

To these one would add that the concentration on cash products for the Hollandia market itself imposed limitations on the extent of economic development, while the improved communications with that centre necessary to achieve this result, opened up further prospects of disturbances in the labour situation and so in social relations.

Nimboran women harvesting ground-nuts. Right: Storing rice and maize, grown as a project activity.

To this reviewer the very frank appraisal of one pilot demonstration confirms disturbing reflections induced by other "pilot demonstrations" in the South Pacific area. The demonstration avoids the defects in some others in that it was more closely integrated into the normal administrative pattern, made provision for co-ordination, and despite an insufficiently positive approach towards "social" aspects, was more broadly conceived than some others. But it was too short-lived to achieve satisfactory results, and as the events proved, was regarded as too expensive for "duplicability." The author of the Report states that in consequence of the "heavy demand on the government apparatus" the Government decided "to discontinue its original approach and adopt a different policy . . . the development project . . . became a closed phase in the history of Nimboran society". Administratively, this may be the case; but for Nimboran society it was not a closed phase.

If a demonstration project is to serve its purpose in providing guidance to administrators care must be taken—in the form it takes and in the services provided—that it is not, in fact, too expensive for duplication. But the effects on the society selected as a guinea pig must also be taken into account. A concentrated effort over so short a period as three years is bound to be disruptive, and responsibility to the community selected demands that they be not then left to their fate. The "different policy" referred to no doubt takes care of the necessity in Nimboran for continued services beyond the demonstration period; but this has not been the case in all pilot demonstrations.

The Nimboran report prompts one final observation. I have the impression that the partial, short-lived projects in the area have contributed to the lack of understanding of what community development means and implies, and to the scepticism among administrators concerning this approach by helping promote the false notion that community development is a specialized *mystique* which in the Pacific area has failed. Elsewhere I have given my personal views on the requirements for a demonstration if it is to serve its purpose in providing adequate guidance to administrators.*

It is probably now too late to begin again with a demonstration which satisfies such requirements, though something might be retrieved by a frank and analytical assessment of the various projects so far undertaken. At least it is important, however, to get across the idea that community development is not a specialized *mystique*, peculiarly expensive, but that in essence it consists of the re-orientation and more effective co-ordination of government services (which are, or should be, provided in any case), directed to promoting fuller participation of the people. It therefore implies the better use of agencies and facilities to the maximum which can be afforded, not an exotic device more expensive than can be used save in a favoured area.

* *The Communities Project Approach to Economic Development*: South Pacific Commission Technical Paper No. 84.

Women winnowing rice using "tampirs" of plaited bamboo. Right: Nimboran co-operative store, Genjem.

Low-Cost Homes By Aided Self-Help

The basic essentials of aided self-help housing programmes now being carried out in various tropical countries are described in this second and concluding instalment.

A rural zone house being built under the Mutual Aid Plan at Carolina, Puerto Rico.

THE principles of aided self-help housing have been applied in many tropical areas, and have been received with much enthusiasm by the participating governments and families. Though the pioneers in this field have been the countries of the Caribbean, the growing industrial and commercial expansion in Africa has caused some acute housing shortages, and among other schemes aided self-help methods have proved very effective.

In India these methods have been used to deal with the refugee re-settlement problem. At Faribad, 10 miles from Delhi, a whole new township is being built on the basis of self-help. In this town over 40,000 refugees are being re-settled with their own schools, shops and meeting place. The initial impetus came from a small group of men from an international service team supported by the Indian Government. Building is entirely co-operative and no contractors are employed.

After the hurricane struck Fiji in January 1952 the Government Architect, Mr. C. N. Nettleton, produced a scheme for low-cost permanent housing for industrial workers; the house was designed and then prefabricated in quantity in the Public Works Department workshops, sold to the applicant and erected by him under government supervision. The prototype consisted of two 3-roomed units, each costing £458 Fijian, under one roof but with separate entrances.

Separate sanitary accommodation is provided at the rear of the building, comprising a shower and W.C. for each family, but using a common septic tank. These buildings are hurricane-proof and designed to take full advantage of the weather.

In Greece, 70,000 families re-built their homes which had been destroyed during World War II and the revolution which followed. Sweden of course has used aided self-help for housing for many years.

In Burma the self-help principle has been applied to housing improvement. Many of the lower income groups live in small thatched huts. The life of thatch in this area is from one to three years, and the average life of the hut about five years. The thatch leaks, is highly inflammable and harbours vermin, while in addition to these drawbacks there is the regular expense of replacement.

The Burmese Government believed that if a durable sanitary and fireproof roofing material could be supplied at about the same overall cost over a period of years as the thatch, better housing would result, since with more adequate roofing the structure underneath would last considerably longer.

Early in 1953 the Government released, at cost price, sheets of corrugated asbestos and aluminium roofing to owner occupants not financially able to purchase this type of material on the open market when and if available. One-sixth of the value of the material was required in cash as a down payment and the balance in instalments over a five-year period at 6% interest. Collections were made by the headman of the village and deposited in the sub-Treasury. The Government retained the title to the roofing material until all payments were completed.

In Formosa after the hurricane in 1952, housing conditions were most unsatisfactory, especially in the port areas. The dock workers were probably the hardest hit of all. Their union had some accumulated welfare funds, which were used, supplemented by funds from the Government, to build a number of homes using the aided self-help principle. Actual construction started on September 27, 1953. After some delays, caused by over-much emphasis on group action, it was decided that each family would be responsible only for the work on its own house, and in May 1954 the houses were ready for occupation. Joint deeds will be held by the householders and the Dockworkers' Union until re-payment is completed.

These different types of aided self-help housing show that it is possible to provide suitable houses economically for people of lower incomes. These schemes do, however, usually need groups that are community-minded or who with some instruction and help can become so. To carry any aided self-help scheme to a successful conclusion it is essential that it be flexible and that it can be adjusted to local customs, conditions and materials. Thus in a nation of rugged individualists, where people do not normally work in groups, the family working as a unit builds its own house with a certain amount of informal group action, such as help from neighbours or friends to assist with parts of the work.

Efficient Administrations Essential

In aided self-help schemes, administration of the housing programmes is most important. Since the basic requirement of such a programme is effective co-operation between the people and the contributor of aid, it is essential that the people have confidence that the programme will be properly administered. In short, the people must know that if they do their part the administration will be ready and willing to render the aid promptly and effectively. Prior to embarking on an aided self-help plan, the administration must be so organised as to be able to carry out its share of the programme in such a manner that the enthusiasm of the participants, so

Row of fishermen's cottages built under an aided self-help plan near Paramaribo, Dutch Guiana.

important in a project of this kind, will not be extinguished.

Financial planning for aided self-help housing requires that firm policy decisions be taken before operations begin. The nature of the programme will largely determine who is eligible to participate and if necessary a means test may be applied to ensure that the most needy families have first priority for housing. But it is essential that to begin with, some standards of eligibility be set.

Closely related to the question of eligibility of participants is the problem of advances of the initial capital costs. These costs can be undertaken by the government concerned, by private industries for their own employees, by labour unions, or by co-operative societies.

The land problem will differ from area to area, but basically the participant in aided self-help must be assured of security of tenure. Either the land must be supplied by the contributor of aid or sold or leased to the householder at an amount he can afford.

A decision must be reached as to how much money, in addition to labour, a prospective home-owner can be expected to invest. The answer lies in the nature of the programme and in the income of the families. In short, the subsidies should relate to the ability of a householder to repay the cost of his home. Similarly, down payments should ideally be fitted to the capacity of the borrower. Interest rates should be kept at a reasonable level to enable the mortgagee to repay his loan over a given number of years. The size of the loan and the repayment period should be tailored to fit the capacity of the family to make repayment as well as to the resources of the contributor-of-aid. If the interest rate is kept low, then longer re-payment periods will lighten the burden of the borrower, but at a high rate of interest, say 8%, it proves uneconomic for the loan to be repaid over too long a term.

The borrower should be protected against foreclosure of his mortgage through default of payment under certain circumstances, such as prolonged illness, death of wage earner or enforced unemployment. The problem, however, is to separate the genuine case of hardship from that where the man will not meet his responsibilities. A carefully-drawn loan contract would to an extent make this distinction, but the ultimate responsibility for the decision will lie with the administering authority.

It is sometimes advisable to include the rates, taxes and insurance with the regular monthly re-payments. A fixed date and place should be set for collection, and in order to ensure prompt repayments the collector should be firm but understanding.

The procuring of materials and equipment should preferably be undertaken by the sponsoring authority, and then these are either loaned or rented to the participants in the scheme. At the same time the people borrowing the equipment must be made responsible for its care, and if necessary forced to replace any lost or ruined tools.

Responsible and interested technical experts can not only help the self-help builders but also watch the costs, and where possible reduce the costs of houses. For that reason it is well worthwhile for the government or sponsor of the project to supply these technicians without charging the scheme with their salaries or expenses.

Most authorities who have investigated aided self-help housing schemes are agreed that such scheme can provide a large part of the answer to low-cost building in depressed areas because traditional building methods and local materials are used, a minimum number of trained technicians is required, the local families are enabled to learn new skills and are not dependent on any extra labour force, and the government can thus erect the maximum number of houses at the minimum cost.

Not the least of the further gains that accrue is the stimulation of greater economic activity and development. As well as achieving the tangible results that have been portrayed, most of these schemes have been magnificent advertisements for community activity and development.

Ninth Pacific Science Congress Held At Bangkok

The Ninth Pacific Science Congress of the Pacific Science Association was held at Bangkok from November 18 to 30 under the joint auspices of the Thailand Government and the Science Society of Thailand.

Over eight hundred scientists of many nationalities attended, representing a wide range of disciplines. Delegates from the South Pacific Commission were Dr. Emile Massal, Executive Officer for Health, and Dr. Richard Seddon, Executive Officer for Social Development.

The last two meetings of the Congress were held at Auckland, New Zealand (1949) and Quezon City, Philippines (1953). These gatherings are organized by the Pacific Science Association in furtherance of its aims, which are to initiate and promote co-operation in the study of scientific problems relating to the Pacific region, more particularly those affecting the prosperity and well-being of Pacific peoples, and to strengthen the bonds of peace among Pacific peoples by promoting a feeling of brotherhood among scientists of all the Pacific countries.

Mosquito-Borne Diseases Expert Visits Niue

During September and October Dr. M. O. T. Iyengar, the Commission's specialist on mosquito-borne diseases, carried out an investigation on filariasis in Niue Island. A representative sample of the population was examined and the local factors that favoured the prevalence of the disease were studied. It was found that roughly four people in every hundred on the island suffer from elephantiasis.

From the results of his enquiry Dr. Iyengar proposed to the authorities a scheme for controlling filariasis on the island. He also gave talks to people of the villages, explaining to them the way in which the disease could be controlled through their active collaboration with the Administration.

The Sanitary Inspector of Niue, who attended the course on health education held recently at Commission headquarters, will continue these group talks with a view to educating the people and enlisting their co-operation in the control of the disease, which in Niue is largely due to factors created by man.

Mechanization Of Tropical Agriculture In The Pacific

Applying fertilizer to pineapples and spraying weed killer between the rows, in one operation.

Reliability and ease of repair are all-important essentials in agricultural equipment selected for use in South Pacific territories, where as a general rule mechanics are scarce and spare parts difficult to obtain. These and other requirements of successful mechanization of Pacific agriculture are discussed below by the author, who also suggests suitable types of equipment for specific crops grown in the region.

By R. R. MASON*

YEAR by year agriculture in the temperate countries of the world becomes more highly mechanized, and the output per worker steadily increases. In Britain, in our parents' days, a good man would mow an acre of wheat a day with a scythe; but it still had to be tied into sheaves, stooked, carried, stacked, and finally threshed.

The reaper followed; and then the binder, so that one man could cut ten acres a day and leave it tied in sheaves. Since the war, combine harvesters have become nearly universal; they allow two men to turn corn-fields into sacks of grain at an unprecedented rate. But rarely in the tropics do we find such specialized methods, or such high production per man.

The primary reasons for adopting mechanization anywhere are the shortage and high cost of labour; and the degree of mechanization in the tropics is highest where labour costs are high, as for example in Hawaii, where large machines are used to assist in harvesting pineapples and sugar cane. Another factor is speed; this is particularly important where the weather limits the time during which an operation may be carried out, as frequently happens in the wet tropics, or where a crop such as sugar cane has to be delivered to a factory at a high rate. Next, extra power is often a great benefit, as in breaking-in new land, in ploughing deeply to smash a soil pan, or in giving an efficient spray to cover a tall crop. Finally, there is the possibility of easing hard physical work such as by hulling rice by machine instead of pounding by hand; and the production of a more uniform product as given by any type of crop grader.

But even when one or more of these reasons applies in favour of mechanization of a process, there are various conditions which have to be fulfilled. Foremost of these is the provision of capital. This is most difficult in primitive communities which are not sufficiently money-conscious, or where communal systems stifle individual responsibility. Agricultural and industrial loans boards have been set up in some territories since the war; and they normally grant a loan on rather less security than a bank. There would also be less hesitation in granting a loan for the purchase of machinery than for more edible assets such as working bullocks. Where selling agricultural machinery is well established and there is competition between various agents, easy terms are usually offered to prospective purchasers. But such financial help is unlikely where there is less development and less competition, and here the problem of finance is most acute.

The other conditions are more straightforward. Field work cannot be done by machinery if the land is too steep or too rocky, or is inaccessible. Difficulties of transport apply particularly to groups of small islands which are often planted up to coconuts; and even on large islands it is often impossible to extend the use of a heavy scrub-clearing machinery unit working on a contract basis from plantation to plantation unless development of the area has resulted in construction of roads.

Simplicity Of Operation Essential

So far we have mainly considered the use of tractors; but whatever type of machine is used under the conditions of the South Pacific Commission region, simplicity of operation and of maintenance is a pre-requisite for success. Reliability and ease of repair are so important in isolated areas that efficiency of operation must regrettably often take second place.

The saving of a gallon or two of fuel a day would not be worthwhile if the risk of breakdown were increased, for in isolated places even a simple fault might put the machine out of action for several months while spare parts are being obtained. To take an example, the author would be doubtful about recommending a diesel engine for use on an isolated plantation in preference to a petrol one, unless the owner was of above average mechanical competence. Otherwise dirty fuel and carelessness with fuel filters might cause serious damage to the delicate fuel pump. For the same reason the less frequently that valve clearances need checking or that decarbonization is required, the better in such cases.

Such troubles do not occur where the agents provide efficient after-sales service, but unfortunately this is not usual unless the tractor manufacturer demands it and volume of sales can support it. One of the difficulties inherent in the initial stages of mechanization, or in established but non-intensive mechaniza-

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A vaned drum roller under trial for cultivating wet padi land for rice growing. Koronivia Agricultural Station, Fiji.

tion, is that tractor dealers and agents cannot afford to lock up a high proportion of their available capital by carrying large stocks of spare parts for only a few machines of each type. A possible solution would be first to select the most suitable machine of each type, and then to standardize on these; but to be effective this would require legislating for a monopoly, which could not be justified.

Mayne has discussed the problems of agents in East Africa, and has commented on the importance of the part they have to play.[1] In Fiji, the agents for the most popular tractors are able to give efficient after-sales service and to make routine visits to tractor owners. This is of especial value where the owners are comparatively unversed in the ways of machinery; for apart from the obvious danger of serious breakdown there is the more frequent trouble of inefficient operation due to such simple matters as a faulty carburettor setting or the need of a valve grind. But such service is impossible in more backward areas such as the Solomons, where not only is the number of tractors very small but also they are scattered over a considerable number of islands.

In considering the possible development of agricultural mechanization in this region, the question of the suitability of existing equipment must be considered. Mayne has stressed that economic mechanization in Colonial territories depends on the use of standard machinery, produced in quantity. The post-war mechanization in Fiji has been shown to be due in a large part to the much greater versatility of present designs of small to medium-sized wheeled tractors in comparison with crawlers.[2] Thus farming operations can be mechanized to a greater extent, and more labour saved.

Trained Operators Needed

One of the limiting factors to efficient use of machinery will always be the ability of the operator. The simple fact is that operating a tractor (which is taken to include driving and regular servicing) and using an implement such as a plough are jobs requiring a considerable degree of skill which can only be acquired by experience. Suitable experience can be obtained if there are European settlers who themselves are experienced and efficient in using machinery. But such training is too rarely available. A training course might be provided by the agents, or by government bodies, or by private companies operating on a sufficiently large scale. Courses operated by the agents would be most suitable (provided the agents' practical knowledge is adequate; unfortunately this is not always so). Such courses might be subsidised by government if necessary to reduce the cost to the learner-drivers.

Equipment For Cultivating Sugar Cane

Turning now from general considerations to specific crops, let us first consider the equipment available for cultivating sugar cane, since this crop is more nearly fully mechanized than others in this region.

Preparation of the ground is almost invariably carried out by disc plough, and a 28-inch diameter disc is preferable to a smaller one since its cutting action through trash is better. When working in trash, discs must be kept sharp. It is an advantage if the angle between the disc and line of travel can be reduced slightly in such conditions. If trash has been buried, further preparation must be done by disc harrows rather than by tined implements.

The cane setts, pieces of stem 12 to 18 inches long, are planted on the bottom of furrows, which are from 4 feet 6 inches to 6 feet apart. In dry weather the furrows should be 12 inches deep (although less depth is necessary in wet weather); and this is beyond the range of the usual type of ridger made for potatoes, etc. Extra wings can be fitted, but the beam carrying the ridger body may not be strong enough for the extra strain of deeper working. Specially-designed lister bodies are available in the cane-growing areas of Australia.

After the cane starts to grow, intercultivation can be carried out by

Single-bladed rotary cutter being used to slash Hibiscus Burr.

1 Mayne, J. E.—Progress in the mechanization of farming in the colonial territories. Parts I to III. Trop. Agric. Trin., Vol. 31, No. 3, p. 178; Vol. 32, No. 2, p. 95; Vol. 33, No. 4, p. 272.

2 Mason, R. R.—Tractors in Fiji. Agric. J. Fiji, Vol. 33, No. 2, p. 2.

straddling the row until the stem of the young cane reaches the lowest part of the tractor or tool bar. Alternatively, special narrow tractors are available and can be used for cultivating between the rows if the distance is made slightly greater than normal; such a method has the advantage that it can be continued until the cane is out of hand and no longer needs inter-cultivating. (In either case discs or mouldboard plough having right and left-hand bodies can be used to throw the soil towards or away from the rows.)

Although mechanical grabs are used for harvesting in Hawaii, all cane in Fiji is harvested by hand. There seems little chance of this process being more efficiently done by machine, although it might be done more cheaply. If it were cut by machine, then front-end loaders and large trailers might replace hand-loading of the trucks on the narrow-gauge tramlines.

After cutting, the land is ploughed away from the cane rows to encourage re-growth, and a ratoon crop is harvested a year later after similar cultivations. The crop is usually ploughed out after one ratoon. Since the land may be baked hard at this time of year, and since the cane stooks rise above the ground, a strong plough with a good clearance is required.

Mechanizing Coconut Growing

Coconuts are an important crop throughout the South Pacific, but the scope of mechanization in reducing hand labour is limited. Experiments in progress by Messrs. Levers Pacific Plantations Pty. Ltd. in the Solomons on preparation of planting holes indicate that on suitable land a post-hole digger can be satisfactorily used for this job, a 12-inch auger being used and either one or three closely-adjacent holes drilled.[3] The single hole is preferred unless fertilizers are used.

The use of tractors is usually confined to transport and weed control. Nuts are picked up from the ground by hand, collected in heaps and split. The kernel or meat is extracted and bagged preparatory to cartage to the drier. It is very important for the sake of quality that not more than four hours elapse between cutting and commencing to dry; otherwise bacterial decomposition will commence, resulting in a brown discoloration of the copra. To carry whole nuts to the drier, to husk them, and to dry half-nuts instead of extracted meat is greater trouble, but results in better copra. Transport is also required for the dry copra to the jetty for shipment or by road to the buying point.

Coconuts are normally planted in rows 27 or 30 feet apart, so there is room enough for tractors to work; but many village groves are quite irregular and may be very dense because fallen nuts have germinated and been allowed to grow up. In the Solomons, plantations were neglected during the war years and many have not yet been cleared of the heavy bush growth, while in some Fiji plantations guava grows rapidly and reaches the crowns of young palms. For clearing it, either hand labour or a heavy bulldozer is required; transport difficulties have already been referred to.

On moderately cheap land, provided slope and stoniness are not too severe, re-growth of weeds can be controlled by hand labour, rotary cutters or heavy-vaned rollers. Spraying with weedicide is another method, and a study of the economics of each—which will depend so largely on local conditions—should be made before one method is adopted. Cultivation is not recommended because of the dense mat of roots close to the surface. Towing a section of heavy anchor chain (the ends being held apart by a spacer-bar) is one of the simplest methods of weed control, and does not affect the fallen nuts. It does not destroy weed growth as thoroughly as the disintegrating action of a rotary cutter, but can be used over rougher ground.

Mechanizing Rice Cultivation

Investigations into the possibilities of mechanizing the cultivation of rice are proceeding in several tropical countries, notably Malaya.[4,5] No insuperable problem is presented when a hard pan exists or can be produced below the surface, but the experience in Fiji is that this condition is the exception.[6] On soft, bottomless swamps, increasing the width of wheels or tracks will eventually give sufficient float, but a great amount of power is absorbed leaving comparatively little for the implement. Thus a high power to weight ratio is desirable.

If weather and soil conditions permit it is preferable to drill the seed before flooding, but the bottleneck occurs at harvesting time. Experience with a 12-foot wheat combine-harvester in the Solomons proved how unsatisfactory is such a heavy and unsuitable type, but Haynes[7] has reported considerable success in Malaya with a rice-combine.

Tropical Root Crops

Tropical root crops are not usually cultivated in large areas, since most varieties cannot be stored but must be consumed as lifted. However, Cassava and sweet potatoes can be successfully planted on ridges and inter-cultivated with the standard implements used for growing potatoes in temperate countries. Cassava grown in this way and kept clean by two or three inter-cultivations with one hand weeding is an excellent cleaning crop. Sweet potatoes can be lifted by a potato plough, but it is necessary to rake off the vines first.

Efficient Pasture Management

Pasture management is at last beginning to receive proper attention in the tropics. Fencing is the first aspect of management, and tractors can assist in driving concrete mixers (the mounted type being particularly useful), in carting posts, and in preparing holes. Post-hole diggers, however, are limited to moderately level land free from rocks.

Weed control is the next aspect, for which machinery is essential. Our tropical grass species do not in general respond to the normal temperature method of chain harrowing; instead, Para grass (*Brachiaria mutica*) requires treatment with a heavy disc harrow or poly-disc plough every two or three years to rejuvenate it, and Guinea grass (*Panicum maximum*) may need topping with a mower to prevent it becoming too stemmy. Most other pastures require topping with a mower at intervals to control weeds, or spraying with weed-killer. A rotary mower is much more suitable than a reciprocating knife, as it is simpler and does not easily choke. Spraying is usually possible even on rough ground, as even if the tractor cannot travel over all the ground, single nozzles on long hoses can be used for spot-spraying the weeds.

These details of specific crops do not by any means exhaust the subject, but serve to provide examples of the extent to which mechanization may be economically sound.

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[3] Green, A. H.—Agronomy Report, 30/5/57 (not published).

[4] Allen, E. F., et al.—Investigations into the mechanical cultivation of padi in Malaya. Bull., Dept. Agric. Malaya, Mech. Series No. 1, 1950.

[5] Mason, R. R.—Mechanization of wet padi cultivation. Bull. No. 26, Dept. of Agric., Fiji.

[6] Mason, R. R.—Some comparisons between rice growing in Malaya and Fiji.

[7] Haynes, D. W. M.—Further investigations into the combine harvesting of wet padi. Malay. Agric. J., Vol. 38, No. 4, p. 237.

Training Fishermen In American Samoa

In American Samoa the Administration is sponsoring a scheme for training Samoan fishermen to catch the kind and quantity of fish needed for the fish cannery there, run by the Van Camp Sea Food Company of California.

The company is now obtaining its fish from two Japanese concerns operating between 25 and 30 small fishing vessels out of Pago Pago. The Samoan volunteer trainees are attached to the crews of these vessels. During voyages of from three to four weeks' duration, trainees take part in every phase of long-line fishing.

Above: A poor house—badly constructed, dark, poorly ventilated, untidy surroundings. Sepik region, New Guinea. Right, top: A better house—well-built, clean surroundings, windows and doors give light and air. Western Samoa. Right: Better still—a large house, with unrestricted light and air (though suitable only where the weather is always warm). Western Samoa.

The Meaning Of Public Health

The basic principles and needs of public health are discussed in this article, which was prepared as a background Paper for the health education training course for Pacific islanders, held at Commission headquarters in July and August last year.

By T. C. LONIE*

IT is sometimes difficult for people to understand exactly what is meant by the term Public Health. Sometimes it means everything that has got to do with the health and well-being of communities, villages, towns or countries, including probably child health services, the welfare of mothers, care of the crippled, blind or deaf, sanitation, food hygiene, even the care of the sick and the maintenance of hospitals, in fact anything and everything which has any connection with the health of individuals or communities.

But for the purpose of this paper I am going to take Public Health to mean the study of the actions and reactions of people living together; the causes and results of the things which happen to them in their communities, and their effect, not only on their own health and well-being, but on the health and well-being of others. We wish then to ask this question: What are the most important principles of Public Health. What are the basic needs which must be met before we can have a healthy community?

Let us look then at the kind of community which we know most about in the Pacific, namely, the village.

A Man And His Habits

It is easy to see how the things a man does or fails to do can affect his own health. The man who fails to wash himself or his clothes, and to keep himself clean, is extremely likely to contract or develop skin diseases, and septic conditions of the skin, and may stand the risk of contracting other infections from parasites like fleas and lice, which are favoured by such circumstances. If he is careless as to the disposal of faeces and of such things as hand-washing after using a privy, he may lay himself open to risk of gastro-intestinal infections such as diarrhoea and dysentery, typhoid fever, and worm infestations.

Deposits of faeces or refuse may contaminate water, or encourage fly breeding. Flies will not only annoy him but will foul his skin and food with their filth-laden feet. They may help to bring yaws to him as well as the diarrhoeal diseases.

If he keeps old bottles and tins and so on round his house, he will shortly have a plague of mosquitoes, and may in some places contact filariasis.

So a person's own actions can affect his own health. But of course we see quite easily that they also affect the health of his family. The dirty-footed fly alights not only on the food of the dirty man, but on his family's food, and his neighbour's food as well. The water which the dirty man has contaminated may be used by other people, often people who don't know it has been made foul. The filaria-infected mosquito is very likely to infect the neighbour of the man who may have allowed it to breed around his own house first, and from whom it became infected. Those who have contracted infectious disease may by their lack of care of themselves, of their way of living, become a source of danger to those around them.

So private health and private habits are not private at all, and may very

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In the Waropen district of Netherlands New Guinea, fresh water has often to be carried in bamboo containers some distance to the villages.

This is better—a village water tank fed from corrugated iron roofs. Western Samoa.

easily affect the family, the neighbours, the village. In fact, they affect Public Health. The freedom in living which we enjoy is limited by the need that we should not interfere with the health and welfare of others.

It is the job of the health educator, the assistant medical practitioner, the district nurse, the health inspector, the teacher, not only to see all this quite clearly, but to know and understand it so well that it becomes part of their normal thought, and constantly in their minds as they go about their work. Above all, it is their job to help others to see it as well, to preach and teach it always, and never to fail in their efforts to get those among whom they work to understand it too.

Old Ways May Be Good

Before we go on to consider the various matters concerned in this, there is another thing to remember. Nearly all communities, through long experience, and for reasons sometimes long forgotten, have learned that to do certain things is not good for their health or well-being. For instance, there are often all sorts of taboos, customs, or restrictions concerned with the use of certain sources of water. There are often separate streams for drinking, and washing; there are rules about where privies may be built, and where not; there are customs about what food to eat and when; about cooking; about refuse disposal, and so on. Sometimes old legends are told about the reason why certain things are or are not done. Whatever the custom or the story, we should never discard or disbelieve its value without careful study. If the custom is clearly bad or dangerous, then, of course, we must not encourage it, but if it is good, it is very important to keep it. A thing is not bad just because it is old. Moreover, people are much more likely to support and follow a teaching if it is in line with the kind of things they already believe and practice.

In one village in Samoa, the woman who draw water from the well must not approach it except in a white garment, that is, wearing something which stands for purity and cleanliness. In fact, they must cover up or discard their dirty garments. Then they must not dip their own bucket or tin into the well, but use one provided for that purpose. Their own must be kept away from the edge of the well, and the clean water is then poured into it. If these things are not done, then, it is said, the water will become milky and contaminated. An old superstition, you may say. But wait. Suppose the person drawing water was unclean or had dirty clothing. Might it not be that some of that dirtiness might be washed into the well? Suppose a dirty bucket went into the well, would it not contaminate the water? And it would be so easy, too, to wash clothes at the edge of the well, and for the contaminated soapy washings to run back into it. *An old custom but a good one.*

From this it is an easy step to the First Basic Principle of Public Health.

BASIC NEEDS 1. GOOD WATER.

The Public Health requires the provision to the people of a *pure and sufficient water supply of good quality* and its protection from contamination.

There is no need to teach people that they must have water to drink, to cook with, and generally to wash with. But it is often very important to talk to them about the need for *pure* water, what it is, and how to set about getting it. It is, of course, worse than useless to give them a lot of detailed information about the chemistry and bacteriology of water supplies, bad and good. They just won't understand. It is equally foolish to talk about a piped water supply in a place where there is no immediate likelihood of getting such a supply. The wise person will find out all about the local supply, and what might be necessary to improve it. But meanwhile he will tell the people how to avoid trouble with the supply they have. If it is a well, he will be able to tell them how to protect it from being fouled by dirty buckets and tins being used to draw the water. He will be able to tell them how to protect and build up the mouth of the well and surroundings so that dirty water or spilt water does not run back into the well. There are other things he may be able to advise about: where to dig a well; how to do it, and many other practical points.

There are river and stream sources of water, too, which will have to be discussed from time to time, and the person advising village people should always know the elementary principles of selecting the places to be used for taking drinking water, for washing, etc., and where a privy ought to be built in relation to these.

BASIC NEEDS 2. GOOD FOOD.

The Public Health requires the provision of *food in sufficient quantity and variety* of good quality, and its *protection from contamination and shortage.*

To satisfy this principle the health educator clearly must know something of nutrition but he must also know and be able to advise his hearers on the way in which to preserve food, and how to prevent its contamination at all stages from its production to the time at which it is brought into use. All this is a very big field of knowledge of itself, and it would not be expected that the health educator should know *all* the details, but he must know sufficient to enable him

Mosquitoes, flies and rats breed prolifically in neglected rubbish dumps such as this.

to advise on the important aspects of the subject so far as they are concerned. About it we say no more here, since another paper will be covering most of the ground in detail.

Basic Needs 3. Waste Disposal

Of all creatures on earth, man certainly appears to produce more waste material than any other. Not only does he produce the ordinary human waste products—faeces and urine—but he produces also waste water from washing himself and his belongings, cooking waste, discarded refuse of all kinds—rags, paper, tins—and much else.

All this is very large in total amount, and, unless got rid of in a sanitary manner, is a most important source of the spread of disease. For instance, the discharges from a person suffering from typhoid fever must not be permitted to poison a water supply or to contaminate food. Refuse allowed to accumulate may breed flies, or harbour rats, and both flies and rats may contaminate and spoil human food. Dangerous mosquitoes may breed in tins or other waste articles capable of holding water.

Here then is a further basic principle of Public Health: *The Public Health depends on the sanitary disposal of waste.* Upon this subject the health educator will receive some instruction. Working in any area in the South Pacific he will find that this branch of health teaching must receive his attention, and, as in other subjects, he will need a good background of knowledge to enable him to handle it properly. His talk on and demonstration of the evils of fly breeding must lead on to some indication of what is to be done to prevent fly breeding.

Remember, too, that here, as always, teaching must be definite and precise. It is of no use saying: "Well, fly breeding is a bad thing, you must ask a sanitary inspector what to do about it". If the sanitary inspector is with you, that is fine. He can give the instruction. But isn't it much more likely that there may be no sanitary inspector within miles. Maybe there isn't one at all! The health educator must never be content just to say what is wrong; he must be able to say also quite clearly what is to be done. That means that he must be able to give some instruction then and there. Maybe what he has got to advise isn't the full and final solution, but there is always something that can be done.

Good water, good food, sanitary disposal of waste—what next?

Basic Needs 4. Protection From Disease.

The Public Health requires protection from disease. That, of course, is the purpose in looking after the quality and purity of water and food. For this major purpose, too, we ensure the sanitary disposal of excreta, of waste water, of refuse. But when all this is done, there is still something more. Certainly health and cleanliness go together, but not *all* diseases can be prevented by cleanliness. Many, such as dysentery and diarrhoea, and typhoid fever, and some diseases of the skin can be very much reduced in this way.

But still there are others that require other means of prevention. Diseases spread by *coughing* or the discharges from mouth, throat or nose, need special measures and special teaching. Such diseases are influenza, measles, mumps, scarlet fever, and tuberculosis. They all have some similar ways in which they are spread from the sick (or sometimes the healthy carrier) to others. The principal way of spread is by what is called *Droplet Infection,* in which tiny little particles of infected material coughed out, even breathed out, or in dried infected discharge, pass from the throat and nose of the sick to the healthy people. Just exactly like a fountain of water. The nearer you are to it the more likely are you to get wet—so crowding together makes it easier for the healthy to get infected from persons suffering from the diseases mentioned above.

The health educator must be ready to explain all this, and to show how overcrowded rooms, overcrowded ill-ventilated houses, failure to isolate infectious persons or to take proper care of infected sputum, handkerchiefs, etc., cause disease to spread. Sometimes protection may be ensured by the giving of injections—inoculation or vaccination as we call it. Of this the health educator must also know something.

These then are the basic principles of Public Health. Public Health as we have defined it is only that part of the art of healthy living which depends on the following out by the *community* as much as the individual of certain rules for living in a group, whether a family, a village, a country. It is the duty of the health educator to know what the rules are, and how they can be made to work among the people with whom he is working. Above all, he must know the truth, the *Reason Why* of the rules he is trying to teach. He must believe in them himself.

The people in the world who have been the real educators, the people whose teaching has spread, who have really been believed in and followed, have had their message accepted not because what they had to say was always the best thing, or the highest kind of teaching, but because those who heard them could not help knowing that the teacher himself really believed in what he said. His teaching was like a fire burning in him, so deeply did he feel. And from him others, too, caught fire.

Cyclone Prediction In The Coral Sea

(Continued from page 34)

depression, its intensity, development, course and velocity.

Our means of research will be greatly improved as soon as the Nouméa radiosonic station is in operation. However, past experience shows that one must be extremely cautious when forecasting tropical cyclones, even in an area where observation stations and means of investigation are plentiful.

Our main efforts must therefore be concentrated on transmitting and broadcasting warnings, although this does not preclude interest in any study which might increase our knowledge of tropical phenomena. Ever since its inception the Meteorological Service in New Caledonia has striven to obtain better information. Especially is it always endeavouring to issue warnings earlier and earlier in order to give people more time to safeguard themselves and their property.

Original text: *French.*

Cattle And Horse Breeding In French Polynesia

By MICHEL GUG*

LAST July the author went to New Zealand to purchase for Tahiti a number of animals for breeding purposes. On August 13, fifteen Hereford bulls, five Shorthorn bulls, two Holstein-Friesian bulls, five Hereford heifers and some Berkshire pigs were unloaded in Papeete from the S.S. *Waitemata*.

The Hereford and Shorthorn cattle will be used to improve, by cross-breeding, the local herds for the production of meat. This operation is being conducted in the light of experience gained from importations of 1955, 1953 and earlier years, in the selection of breeds and acclimatization.

SELECTION OF BREEDS: Jerseys and Holstein-Friesians give good yields in dairy farming: an average of 2500 kilograms of milk per lactation for the dairy herd at the Taravao Station. However, the Jersey herd is being progressively reduced. It is not appreciated by the breeders because the milk, which is used almost entirely for drinking, does not bring the price its butterfat content would warrant.

Although excellent in New Zealand, the Aberdeen-Angus breed for fattening has not settled well under island conditions, and has sired badly. The Herefords and Shorthorns, on the contrary, have adapted themselves to tropical conditions and breed well (a definite improvement in size and quality of the carcases has been noticed).

The very first crossbred progeny of a Hereford bull and a local cow shows definite Hereford characteristics.

ACCLIMATIZATION: Imported animals must adapt themselves to conditions of climate, feeding and pathology different from those of their country of origin. Therefore, cattle require careful attention upon arrival and at least until they have become immune to piroplasmosis ("Texas fever") which in certain islands of the territory is a particularly acute and rapidly-developing disease.

Horse Show At Papeete

On September 1 last a horse show was held at the Pirae-Papeete racecourse. Stock was exhibited in seven categories, and twenty-two prizes were offered.

The show was organized by the *Association Hippique et d'Encouragement à l'Elevage* (Riding Club and Organization for the Promotion of Breeding) under the authority of the President, Maitre R. Bambridge. There were brood mares and saddle horses entered, some with show records, and also colts, some of which may well become the champions of the future. The issue of "Lord Coronach", a thoroughbred British stallion, "Contralto", an Anglo-Arab stallion, "Fleuron d'Amour" and "Arion's Pride", half-bred stallions, all now at the Pirae stud, have proved their qualities and adaptability.

Breeders have, generally speaking, improved their techniques; their main problem at present is the adequate feeding of their stock.

ORIGINAL TEXT: FRENCH.

* Head of Department of Livestock and Animal Husbandry in French Polynesia.

How To Preserve Fish

Sun-drying, salting and smoking are simple ways of preserving fish that are described in a booklet *Fish Preservation Simplified* recently published in English and French editions by the South Pacific Commission.

Copies of the booklet are obtainable from Box 5254, G.P.O., Sydney, Australia, or from Commission headquarters, Noumea, New Caledonia (price 1/- Australian, English edition; 10 francs C.F.P., French edition).

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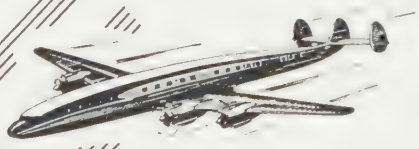

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Above: A field still for producing "tea-tree oil" by steam distillation. The small tank on the left contains the condensing coil immersed in cold water.

Right: Collecting the oil from the receiver.

Essential Oils From "Tea-Trees"

Experimental cultivation in selected Pacific islands of certain species of "tea-trees" to determine if they might be exploited for their commercially-valuable essential oils is proposed by the author of this article.

By F. R. MORRISON

Director, Museum of Applied Arts and Sciences, Sydney

RESIDENTS of New Caledonia and neighbouring islands are familiar with niaouli and cajuput oils, which have been on the market for many years. Both oils are present in the leaves of paper bark "tea-trees" belonging to the genus *Melaleuca,* and have gained a reputation for their therapeutic and germicidal properties. Niaouli oil is popular in France and New Caledonia, while cajuput oil is in great demand by the population of Indonesia.

The principal constituent is cineole, a pungent substance which gives "strength" to these oils, as well as to medicinal eucalyptus oil. The remainder of the oil consists principally of terpineol and its esters, of pleasant lilac odour, together with pinene, the principal constituent of oil of turpentine. The presence of a small quantity of benzaldehyde confers on the oils an almond odour, which is very attractive to some users. In addition to their uses as medicinal oils, they have been successfully employed as flavouring agents in confectionery.

There is little demand for niaouli oil outside of France and her possessions. Cajuput oil has always been in good demand, most of the production formerly having been taken by the Netherlands East Indies. Smaller quantities have been consumed by Holland, Great Britain, Europe and the United States. Both oils are used for similar complaints, namely, coughs and colds, and, externally, for neuralgia and rheumatism. Cajuput oil is also reputed to be of value as an insect repellent and as an anthelmintic, being particularly efficacious for the treatment of round worm.

Although it was formerly considered that these two oils were derived from different species of *Melaleuca,* namely, *M. viridiflora,* Gaertner, and *M. leucadendron,* Linn, respectively, it is generally agreed that cajuput oil has been distilled from a number of *Melaleuca* species, including *M. minor,* growing in the Eastern Archipelago and Malay Peninsula. However, all these species are closely related to *M. viridiflora.* Certainly the oils differ little in composition, although this fact would not necessarily mean that the oils were obtained from the same botanical source.

The yield of oil from these species is not equal to that obtained from commercial eucalyptus species growing in Australia; consequently there is no demand for these oils in Australia. The cineole content of medicinal eucalyptus oils is higher and the yields are more than twice as great. The potential market for these two *Melaleuca* oils, therefore, appears to be in France and the Far East, and it is to these countries that producers of the oils must look for extended markets.

Melaleuca viridiflora, Gaertner, grows extensively on the east coast of Australia, extending to Northern Australia. Until quite recently several species of the genus in these areas had been named by various botanists, but the consensus of opinion now is that a number of different oils are obtained from trees of the one species. The occurrence of so-called 'physiological forms' of species of Australian plants was first observed by Penfold and Morrison in 1924, and since that date many more examples have been discovered. 'Physiological forms' of a species may be defined as plants which cannot be separated by the botanist on morphological grounds, or by any differences when observed growing in the field, but the leaves of which contain oils of radically different chemical composition. *M. viridiflora* is an example, and it is in this respect that oils other than the cajuput or niaouli types, from trees of this species, which are of potential commercial value, have been discovered in the course of researches at the Museum of Applied Arts and Sciences and elsewhere.

During the course of field work in the North Coast district of New South

Black tea-tree (Melaleuca bracteata. F. Muell). Queensland.

Wales, trees of *M. viridiflora* were found, the leaves of which contained fragrant oils consisting of the alcohols nerolidol and linalool, or of nerolidol alone. These alcohols are present in neroli (orange blossom) and lavender oils respectively, and are of considerable commercial value. Unfortunately, trees producing this oil do not occur in sufficiently large stands to warrant exploitation, but are found growing intermingled with the 'cajuput' type. However, it has been demonstrated that plants which develop quickly can be grown from seed, and in a few years produce sufficient foliage for distillation.

Trees cultivated at the Museum's experimental plantation have produced oils similar to that from the parent tree, which consist approximately of 70% of nerolidol and 30% of linalool, together with a small quantity of benzaldehyde. The alcohols were easily separated by fractional distillation. The form containing nerolidol alone does not appear to breed true from seed, consequently it would have to be vegetatively propagated for commercial plantations. It is possible that, following a systematic search of the broad-leaved tea-trees growing in New Caledonia, trees of these forms will be found, the seed of which could be used for cultivation purposes.

Other Uses For Essential Oils

In addition to the uses of essential oils for therapeutic and perfumery purposes, there is an ever-growing demand for insect repellents and insecticides. The volatile or essential oils are favoured owing to their pleasant odours, and, usually, non-toxic properties. During World War II many Australian essential oils were tested, the most effective being those which consisted largely of phenol ethers, such as methyl eugenol and elemicin.

Formerly a source of methyl eugenol, Huon Pine, oil was distilled from sawdust and waste millings of the species *Dacrydium franklini*, growing in the forests of Tasmania. The timber of this species was prized for the building of boats and for other constructional work, but difficulty of access to the forests has now called a halt to the industry.

An alternative source of methyl eugenol has been found in the oil from the foliage of *Melaieuca bracteata*, F. Muell., a tea-tree found growing in the coastal districts of New South Wales and Queensland. Here again we have discovered individual trees of this species which yield oils of different chemical composition, the principal constituents being the phenol ethers known as methyl eugenol, methyl-iso-eugenol, and elemicin, respectively. These compounds have proved efficient as mosquito repellents in their own right, and have also been of value as synergists in greatly improving the "knock-down" properties of the well-known insect sprays derived from *Pyrethrum* flowers. The addition of a small percentage of methyl eugenol or elemicin to a solution of pyrethrum extract increases the knock-down power to such an extent that much less of the latter is required to produce the desired results. (It is of interest to mention that *Pyrethrum* flowers have been successfully cultivated in Kenya, Africa.)

M. bracteata may be grown from seed, and the foliage collected successively for many years for distillation of the oil.

Other species of tea-tree found growing in Australia have been utilised for commercial purposes, although the number is very small when it is realised that over 600 species and varieties of indigenous tea-trees occur in Australia. (It should perhaps be mentioned here that the name "tea-tree" embraces a large number of genera in addition to *Melaleuca*, such as *Leptospermum, Callistemon, Kunzea, Darwinia, Baeckea*, etc. The vernacular name "tea-tree" is derived from the fact that some of the members of Captain Cook's crew, on his voyage of discovery to Australia, used the dried leaves of one of the species as a substitute for tea.)

First Commercial Exploitation

The first tea-tree to be commercially exploited in Australia was the narrow-leaved paper bark tea-tree known as *Melaleuca alternifolia*, Cheel, which occurs in the swamps and along the banks of watercourses in the North Coast district of New South Wales in eastern Australia. The foliage consists of very small, narrow leaves which contain about 1.8% of clear mobile oil, readily obtained by steam distillation.

This process, which is applicable to the treatment of most essential oil-bearing foliage, consists in passing steam through the leaves, thus rupturing the oil cells in the leaves and carrying the oil in the form of vapour into a condensing pipe surrounded by cold water. The condensed steam and oil are received in a special vessel, and the oil, being in most cases lighter than water, floats on the surface, whence it may be skimmed off from time to time. (An exception is the oil of *M. bracteata*, which is heavier than water, and sinks to the bottom of the receiver.)

Crude field stills may consist of 400-gallon ship's iron tanks, arranged in pairs and connected together near the top by 2in. piping. Attached to this pipe is a length of about 30ft. of 2in. piping which is conducted beneath a stream of water. About 80 to 100 gallons of water are placed in each tank, and the foliage, consisting of leaves and terminal branchlets, is packed tightly on to a grid fixed about one foot from the bottom of the tank. When full, iron lids are clamped down by means of metal stirrups and wooden wedges, clay and a strip of hessian being used to make the tanks steam-tight. A fire is placed under each tank, the fuel being wood or spent leaves, and the condensed steam and oil are collected as stated.

Such distillation units may be easily dismantled and transported from place to place, a great advantage in hilly country. However, if areas are flat and the quantity of foliage is sufficient, a steam boiler of large capacity may be employed, which conducts live steam to a series of digesters either above or below the ground. These digesters may have a total capacity of several tons of foliage, and it is obvious that a much larger quantity of oil can be obtained from each distillation by using a separate steam boiler.

Returning to the oil of *Melaleuca alternifolia*, it consists largely of 1-terpinen-4-ol, which has a pleasant nutmeg odour. The terpenes *alpha* and *gamma*

Narrow leaved tea-tree (Melaleuca alternifolia. Cheel). New South Wales. Broad leaved tea-tree (Melaleuca viridiflora. Gaertner). Queensland.

terpinene and cymene, together with a small quantity of cineole—under 10%—are also present. This oil quickly established itself as a germicide, and, in addition, it was found to be non-toxic and non-irritating to sensitive tissues. It also possessed the properties of healing, and of preventing and controlling septic conditions, being particularly useful when pus was present. During World War II a small quantity—about 1%—added to machine "cutting" oils proved effective in preventing infection by metal turnings. It has also been used in soap perfumes, replacing nutmeg oil with advantage.

A closely-related species, *M. linariifolia*, with wider and longer leaves, contains an oil of similar composition, but the alcohol 1-terpinen-4-ol is largely replaced by cineole. Although the germicidal value is equivalent to that of *M. alternifolia*, the presence of from 20 to 60% of cineole renders it unsuitable for similar refined therapeutic applications. However, antiseptic cleaners, soaps, deodorants and the like may be prepared from this oil. Both these species respond well to cultivation.

Prior to the early 1920's, before these oils had been investigated, the trees were a nuisance to the dairy farmer, because it was possible to destroy them only by digging out the roots. Cutting down the trees only made matters worse; sucker or 'ratoon' growth soon began, and in a few months a fine head of foliage had crowned each stump. This rapid re-growth proved a blessing to the distiller, who was able to cut the foliage after about eighteen months, and at subsequent intervals over many years. Thus, what was formerly regarded as a 'farmer's curse' became a source of income.

Lemon-Scented Tea-Tree

A very pleasing tea-tree, both to the eye and the nose, is the "Lemon-scented Tea-tree", *Leptospermum citratum*. It is easily cultivated from seed, is a fast grower, and develops into a foliaceus shrub or tree, the leaves of which are glossy and rich green in colour.

The tree grows naturally on the North Coast of New South Wales and southern Queensland, and the leaves contain about 1.2% of a fragrant-smelling oil consisting mainly of citral (the constituent of lemon oil), and citronellal, which occurs in the oils of citronella and *Eucalyptus citriodora*. During World War II, limited quantities of this oil were obtained from small, natural stands in North Coast districts of New South Wales, but only war-time circumstances warranted its production at high cost.

The species is now being successfully cultivated in Kenya, Africa, where economic conditions are more favourable, and the oil is actually imported into Australia.

Here again, physiological forms occur, the oil from some trees consisting of terpenes with no citral or citronellal (Variety "A"), while other trees bear foliage containing geraniol, citronellol and corresponding esters (Variety "B"), constituents of rose oil. Both the type and Variety "A" breed true to the parent seed, but Variety "B" is unstable, and the progeny grown from the seeds of these trees contain oils varying in composition between the type, Variety "A" and Variety "B". Propagation from cuttings is necessary, therefore, to obtain plants true to the parent tree. *L. citratum* makes an excellent ornamental shrub or hedge, and may be cut for distillation at intervals of 2 to 3 years.

In addition to the essential oils provided by the paper bark tea-trees, the soft layers of bark of some have been exploited in New South Wales, an upholstery filling claimed to be proof against moths and vermin being manufactured from it. According to reports, babies' pillows filled with the treated bark have proved to be "non-suffocating" in use. It has also been recommended as an insulating material.

Pacific Islands Possibilities

Experimental cultivation in New Caledonia and other islands of the Pacific would be necessary to determine if any, or all, of the commercial species of tea-trees could be exploited for their essential oils, but there appears to be no valid reason why the broad-leaved tea-trees should not thrive, given the right conditions. Selection of seed from trees containing the desired oils in economic yields, and the vegetative propagation of some varieties, are necessary requirements, but patient and systematic surveys and experimentation by investigators possessing initiative and enterprise, as well as selective and inquisitive noses, may bring, perhaps, unexpected and rich returns. Such projects are certainly worth a trial.

The Declared Noxious Weeds Of Fiji And Their Control

FOLLOWING the very valuable monograph by J. W. Parham on the grasses of Fiji, published in the Fiji Department of Agriculture's *Bulletin* series, is *The Declared Noxious Weeds of Fiji and Their Control*, by T. L. Mune and J. W. Parham. It is a 73-page illustrated handbook dealing with fifteen species of weeds and the practical methods of controlling them.

As many of the species studied occur in other territories of the South Pacific area, including prickly pear, guava, giant sensitive, prickly solanum, and water hyacinth, this makes the handbook extremely useful not only in Fiji but also for farmers of other islands. All the species studied are well described, and the methods of control very clearly explained.

The handbook is well printed. The illustrations, particularly the line drawings, would enable any layman to identify the noxious weeds. The authors and the Fiji Department of Agriculture are to be congratulated on this excellent publication, which will help many South Pacific farmers to solve their weed control problems.—J.B.

MUNE (T. L.) & PARHAM (J. W.) 1956. *The declared noxious weeds of Fiji*, Bulletin No. 31, Department of Agriculture, Suva. 73 pp, 16 line drawings, 1 map, 16 photographs, botanical index, glossary of terms and bibliography.

Stachytarpheta Mutabilis (Terminal), a shrub which can reach a height of over six feet. Flowers are blue.

Weed-Killing In Tropical Pastures

The various ways in which weeds growing among fodder grasses in tropical pastures can be killed are reviewed below. The author warns that, while chemical weed-killers can be of great value, care is needed in their use.

By MICHEL GUG

Head of Department of Livestock and Animal Husbandry in French Oceania.

HUMID tropical climates encourage a lush growth of vegetation during most of the year, which enables breeders to graze a large number of cattle per acre. However, quite frequently it is impossible to obtain best results from a pasture because the conditions which foster the growth of fodder grass act in the same way towards weeds—herbaceous plants and shrubs—which have no nutritive value whatsoever.

Weed-killing can be achieved in various ways; by biological means, by cutting, treatment by herbicides and general husbandry.

In many cases biological means provide the only practical way of destroying pests. For example, only myxomatosis has enabled us to eradicate the rabbit pest. Parasitology and animal pathology (which, it is hoped, will prove a great help in the fight against the *Oryctes rhinoceros*, parasite of the coconut tree) and plant parasitology will undoubtedly yield much important knowledge capable of useful practical application. Within the Pacific area the campaign, using biological means, against the Lantana (*Lantana camara*—Verbenacae family) affords an excellent example. This plant spreads in pasture land where few cattle are grazed per acre, and is detrimental to the growth of fodder grass. In French Oceania the fight, which was started with the Lantana Seed Fly, has been continued with the introduction in 1940 of a parasite of this type of verbenaceous plant: *Teleonemia lantanae*. Although this insect is active only in cycles and under certain determined conditions, it has certainly impeded the general spread of the plant.

Cutting requires the use of mechanical equipment, either the classical mowing-machine or the rotary slasher. The latter is particularly convenient as it needs practically no maintenance—there are no blades to replace or sharpen—and it tears the plants to shreds, so that the pasture land does not remain completely covered after cutting. Apart from being useful in eradicating weeds when an enclosure is being turned over to grazing, this operation encourages the growth of new grass (young grass is richest in nutritive value) and has a selective action on the vegetation. Some noxious plants do not survive repeated cutting back.

This, however, can be done only in certain seasons and must be worked in with the rotation of cattle in the fields, to ensure a constant supply of fresh young grass of rich nutritive value.

The chemical eradication of weeds by the use of herbicides has gained popularity in the last few years since the discovery of organic weed-killers[1].

From the practical point of view we can distinguish between *total* and *selective* weed-killing. In the first case the chemicals employed are borax, sodium chlorate and, above all, arsenic. How-

[1] A detailed survey has been published under the title *Practical Aspects of Weed-killing by Chemicals in Tropical Crops* by Mr. E. J. E. Lefort, Research Officer for Economic Development (S.P.C. Technical Paper No. 108).

The Lantana shrub in the centre of the photograph (Lantana Camara) is being destroyed by Teleonemia lantanae. Notice the bareness of the branch terminals.

Pasture being treated with selective herbicides, using high-pressure Friend sprayer with two nozzles.

ever, the use of these chemicals can be recommended only for the eradication of whole clumps of noxious plants, or clearing the banks of certain pastures (for example, clumps of *Rubus moluccanus*). For this purpose, arsenic is sprayed on (in this respect, it is worth while mentioning the effectiveness of arsenical cattle dips which are now in common use).

These chemicals will also destroy certain trees if injected into the trunk: Guava-trees, for example, which are so harmful in pasture land, can be selectively eradicated by paint-brush application of an arsenical solution onto a frill-ring. However, there is some danger in using these chemicals (sodium chlorate, potassium chlorate, and arsenic). They are harmful to man, have a sterilizing effect on the soil which lasts for varying periods, and there is always the risk of cattle poisoning. These drawbacks considerably reduce their use as weed-killers.

Selective herbicides are very much easier to handle: they belong to the category of organic weed-killers. Best known are 2-4-D and 2-4-5-T[2]. They are plant hormones or synthetic auxins, and they act by stimulating the growth of certain plants which eventually die of exhaustion. The components of 2-4-D enter the plant through the foliage, whereas those of 2-4-5-T penetrate mainly the woody parts. The combination of these two chemicals is highly effective and many such compounds are available in commercial formulae.

In the following table is given a precis of experiments undertaken in Tahiti (especially at the Zootechnical Station at Taravao). The treatments described do not eliminate the possibility of further infestation.

Directions for use are sufficiently clear to ensure full benefit from the use of selective herbicides. Spraying should take place in calm weather, as the wind may carry spray drift towards sensitive crops in the neighbourhood. The best time to apply herbicides is when plants are in full growth. Finally, minimum atmospheric temperature coupled with a relatively high percentage of humidity will ensure the best possible action of the selected chemicals on the plants affected by them.

Because of the above, the use of weed-killers requires a certain amount of judgment and adaptation to local conditions. There is no doubt that herbicides can be of great value in the general process of pasture maintenance, but trials have been carried out for too short a time yet to enable us to have full knowledge of the possible after-effects of these chemicals. Warnings have already been issued: time alone will tell whether they are justified or not.

The routine maintenance of, and improvements to, pasture land also play a part in the eradication of weeds. Harrowing and the use of fertilizers are the best examples.

The final stage of depredation of a pasture is attained when clumps of gramineous plants spread thickly over the field, their roots entwining at ground level as they can no longer penetrate the saturated soil. Plants are very woody, fodder grass is replaced gradually by weeds, and cover of the ground is very sparse. When this stage has been reached the only possibility is to re-sow the pasture. While this does not prevent weeds from coming up again they will soon disappear, choked by the new fodder grass, provided this has been selected with an eye to strength and suitability to environment. The author has some-

[2] 2-4-D: 2-4 Dichlorophenoxyacetic acid; 2-4-5-T: 2-4-5 Trichlorophenoxyacetic acid.

Scientific Names of Weeds and Noxious Plants	Family	Means of Eradication
Elephantopus mollis *Jussiaea erecta* *Sida rhombifolia* *Stachytarpheta mutabilis* *Cenchrus echinatus* *Lantana camara* *Cyperus* sp.[3]	Composite Onagracae Malvacae Verbenacae Graminacae Verbenacae Cyperacae	Commercial formula containing 24% of 2-3 chlorinated phenoxyacetic acids combined with butylglycol esters: 1¾ pints chemical to 175 pints water. Spray on when plant is in full foliage—March-April—when sap is most active. Twenty pints of water solution will cover 1,650 sq. ft. Two treatments at three-month intervals will eradicate all plants listed in the left column.
Psidium pyriferum	Myrtacae	After felling, paint stumps with following mixture: 2-4-5-T = 1¾ pints water solution to 35 pints kerosene or diesel oil. Three treatments are necessary at two-month intervals, from March to August.
Rubus moluccanus	Rosacae	Commercial formula containing 24% of 2.3 chlorinated phenoxyacetic acids combined with butylglycol ester: 3½ pints to 175 pints water. Spray on when plant is in full foliage and sap most active. Three treatments are necessary at two-month intervals, from March to August.

[3] *Cyperus rotondus* is resistant to phytohormones and therefore only up-rooting will ensure total eradication.

Rotary slasher in operation. Note how cut vegetation is shredded, not deposited in swathes.

times seen a field, newly-sown with *Melinis minutiflora,* invaded by plants from the cyperacae family (particularly *Cyperus rotondus*). However, if sowing had been done properly, the Melinis would gradually spread and destroy the weed by the following year. In normal circumstances a re-sown pasture should afford good grazing for several years without showing any appreciable signs of depreciation.

We must stress the necessity for maintaining adequate grazing on a pasture; too few or too many cattle per acre are equally uneconomic. In the first case, weeds have a better chance of thriving; in the second, there is too heavy a demand on fodder grass, and again weed growth is encouraged.

Determining the correct number of cattle to be grazed on a pasture remains a matter of judgment, involving considerations such as condition of the animals, development of the young and characteristics of the grazing (trampling — quantities grazed — plants not touched). Each type of soil and vegetation, each season command different conditions and the breeder must assess them all in order to work his land efficiently.

Cutting, and to a certain extent the use of selective herbicides, will eradicate weeds from pasture land. Planned cutting will eventually alter the aspect of some pastures (by acting simultaneously on fodder grass and weeds). This can happen to such an extent that, in some countries, it is stated that the best friend of the successful grazier is the mowing-machine.

Finally, in the case of pasture land too far degraded (either through misuse or natural and unavoidable circumstances), the only resource is ploughing and re-sowing. This action, at any level of farming, implies the determination of a rehabilitation policy for pastures.

The technique of ley farming is gradually gaining popularity. It appears to yield maximum results and aims at including grazing land in a set rotation system. Nevertheless, its use should be studied carefully in each individual case, and approached with caution.

ORIGINAL TEXT: French.

Polynesian Society of New Zealand

By JOYCE MONRO*

IN 1892, on January 8th, a group of people met in the library of the Colonial Museum at Wellington, New Zealand. They were all interested in Polynesia and the Polynesians, and proposed to form a society for the study of the area and its inhabitants.

They felt that as native remembrance of pre-European conditions was swiftly fading, no time should be lost in puting on record all available matter. That evening the Polynesian Society was formed to promote the study of the anthropology, ethnology, philology, history, and antiquities of Polynesia. It was decided that a quarterly journal should be established, the *Journal of the Polynesian Society,* and that a collection should be built up of books, manuscripts, photographs, relics, and other illustrations of the history of the Polynesian race.

Although the prime mover in the foundation of the Society, S. Percy Smith, and other noted foundation members, such as Elsdon Best and Edward Tregear, were interested chiefly in Maori culture, the Society has always stressed its interest in a much wider field, and from the beginning the term "Polynesia" was stated to include Australasia, Melanesia, Micronesia, and Malaysia, as well as Polynesia proper.

Over 100 people offered their support when the formation of the Society was first proposed. There are now about 800 members, scattered all over the globe. The majority of the members live in New Zealand, Australia and the Pacific Islands, but there are also members in England, Europe, the United States, Canada, Asia and South Africa.

The writers in the early issues of the Journal were mainly New Zealanders, but the Journal in the last 30 years has attracted writers from all over the world.

Besides building up a library of Pacific materials, and the publication of data, the Society originally had other aims. It was hoped to hold frequent meetings for discussion and the reading of papers. However, with many members resident abroad, and the balance scattered fairly evenly over New Zealand, the holding of meetings was not a very encouraging activity, and from the first the Society's main activity has been the production of the Journal. Of recent years it has followed a policy of aiding approved research. It also publishes reprints from the Journal, and Memoirs, the latter comprising books and studies too long for inclusion in the Journal.

Memoirs On The South Pacific

While roughly half the Memoirs deal with the Maori, the Society has published many first-class memoirs on the South Pacific area, notably:—

Field Notes on the Culture of Vaitupu, Ellice Islands, by D. G. Kennedy.
Fiji Native Plants, With their Medicinal and Other Uses, by Mrs. H. B. Richenda Parham.
Pangai, a Village in Tonga, by Ernest and Pearl Beaglehole.
A Pacific Bibliography: printed matter relating to the Native Peoples of Polynesia, Melanesia and Micronesia, by C. R. H. Taylor, Librarian, Alexander Turnbull Library, Wellington, New Zealand.

(Continued on page 57)

* Mrs. Monro is a New Zealander, who has been on the staff of Auckland University College Library and the New Zealand National Library Service, Wellington.

INTRODUCTORY NOTE

By BRUCE ROBERTS, *Director, South Pacific Commission Literature Bureau*

Anyone who has lived in a small island community knows the many difficulties involved in trying to organize a library. How often the results reflect these difficulties!

One recalls that old question, "If you were marooned on a desert island, what book would you want to have with you?" Bernard Shaw is said to have replied, "A book on boat-building, of course". Our small island dweller is in a more tantalizing situation: the tardy postman delivers a bundle of somewhat dated newspapers and periodicals from his own country and there he sees a series of enticing reviews of all sorts of books from astrophysics to Zoroastrianism; it seems the young novelists are writing better than ever.

Tired of looking at the menu and longing for a real feast, our reader undertakes the complicated and sometimes exhausting task of ordering some of these books by post; but, alas, by the time he receives them several months later his appetite has gone, and oddly enough the neighbours' books always seem more interesting than one's own.

During a recent visit to the Trust Territory of the Pacific Islands I was introduced to the Koror Book Club, and there found a completely refreshing approach to the whole problem, an approach that had several aspects which cut right across some preconceived ideas about libraries. I felt that this Book Club and its methods would be of great interest to other small communities in the Pacific, and so asked its Chairman to write an article for the QUARTERLY BULLETIN *describing exactly how the Club works. Mrs. Heron's article follows.*

The Koror Book Club

The Koror Book Club successfully provides an efficient library service for a small island community. How it does so is explained in this article by the Chairman.

By ANNE WALDRON HERON

THE Koror Book Club is one island's answer to the challenge of procuring and maintaining contemporary reading material in an outpost area. On the island of Koror, site of the Administration of the Palau District of the Trust Territory of the Pacific Islands, the American community averages about sixty adults. Until the Koror Book Club was established the reading members of this community were dependent on a library of World War II vintage, occasional magazines, and an internecine trade in paper-back books.

Early in 1955 the idea was born that a variant of the subscription book club could furnish new contemporary reading material for such Americans who were interested. Since no public funds were available for the purchase of books, they would have to be raised through members' contributions. A preliminary step was made by contacting the San Francisco News Company, one of the large book wholesalers on the west coast of the United States. This company not

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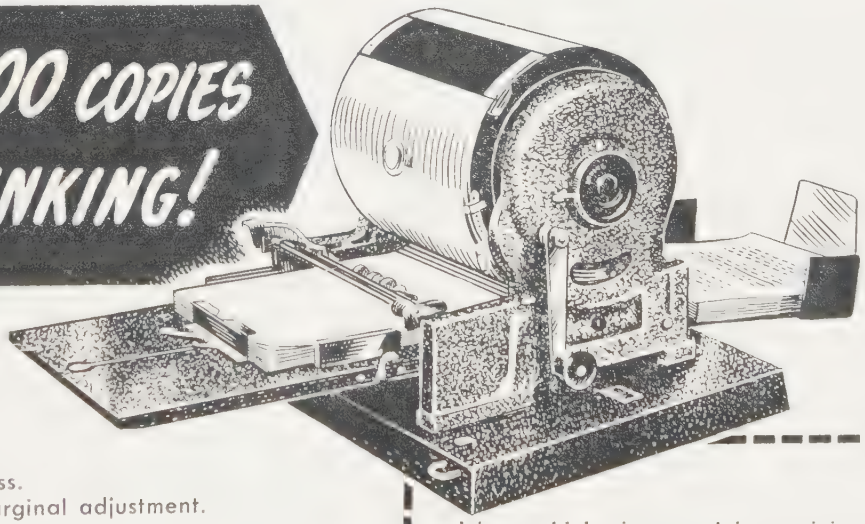

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only accepted our small business but offered an excellent discount and to prepay postage on the books. At the same time they also sent via airmail several copies of *The American News of Books*. This is a trade journal, published monthly, which gives a brief summary and evaluation of all books published commercially during the month.

Monthly dues were set at $3.50. Married couples and single individuals pay the same amount. This figure was decided upon because it is a little less than the average retail price of an American novel and an approximate equivalent to the price paid for the monthly book in a commercial book club. It was also felt that a total monthly minimum of $35.00 was essential to give the venture any chance of success.

A mimeographed memorandum explaining the proposed purchasing system, dues and benefits was sent to all American personnel. The Koror Book Club, originally composed of twelve members, forwarded its first order in April 1955. The membership has grown slowly but steadily, its greatest deterrent to quick growth being turnover of personnel. In the summer of 1956 membership in the Koror Book Club was opened to Palauans at 50c. monthly dues. By April 1957 the membership had grown to twenty-two Americans and six Palauans.

Organization Informal

The organization of the Koror Book Club is most informal. There are no by-laws and no elected officers. Meetings are held as necessity arises to discuss problems or policy and all issues are settled by the expressed opinion of members present.

The two necessary service jobs have been held by the same volunteers since the beginning of the Book Club. The Chairman is responsible for preparing the preliminary lists of books to be ordered and for mailing the monthly orders, and for checking in all new books received. She keeps a permanent record of books ordered, their arrival date, the cost of each book and each order and their ultimate disposition. She makes up the lists of books for sale and those currently on the shelves. She calls meetings and serves as moderator. At least once a year she renders to the membership a written financial accounting of all funds collected and disbursed.

The other "officer" can best be described as Watchdog of the books and Hound-dog of the treasury. Since the use of Book Club books is restricted to members of the Book Club, the shelves have been placed adjacent to her desk in the Administration building. She types cards for the "In and Out" book file and supervises the mimeographing and dispersing of all book lists and notices. She also collects the monthly dues.

Problems are inevitable in any organ-

ization. The most nagging one here is the time lag between order and delivery. Although the San Francisco News Company has given excellent service, Jove does sometimes nod and books temporarily out of stock when our order was received are occasionally not forwarded. Since three months is a reasonable expectation for delivery and since all the books of one order do not habitually arrive on one ship, it is difficult to choose the time at which an inquiry about non-delivery should be made. This situation is complicated the more because the logistics ships serving the Trust Territory districts from Guam move on irregular schedules and consequently do not always receive all the parcel post for the districts. The San Francisco News Company now cooperates with us by sending airmail a copy of their invoices on each shipment.

The selection of books, too, can be a problem. Originally the Chairman made up the monthly book order and circulated the list after the order had been mailed. Some members considered this arbitrary and a few voiced the opinion that each member should be free to choose the book on which his $3.50 was spent. The majority of the membership recognized that highly-specialized interests could not be indulged at the expense of the group, and that the monthly dues furnish a pool of income to meet all tastes. The basic objection has been met by the Chairman's circulating a tentative book order among the membership approximately two weeks in advance of the mailing date. Any member may request additions or deletions. The Chairman still makes the final decision as to which books will be purchased, since she must fit the list into the financial framework.

During the opening months of operation of the Koror Book Club, dissatisfaction was also expressed at having only *The American News of Books* as source of choice for orders. A year's airmail subscription was taken out for *The New York Times Book Review* and was renewed on its expiration. The copies of both these journals are kept on file with the books for the members' consultation.

A reading community as small as the one on Koror does not provide a true norm; consequently best-seller evaluations can serve only as a guide and not as a determinant. As in any other community, circulation depends in large part on word-of-mouth recommendation. The Koror Book Club has tried consistently to buy the best in current fiction and non-fiction. Memberships have been tried in both a Science Fiction Book Club and a Mystery Book Club. The former has been continued, the latter dropped because the members preferred a freer choice of selection than the Club offered.

Since the Koror Book Club facilities

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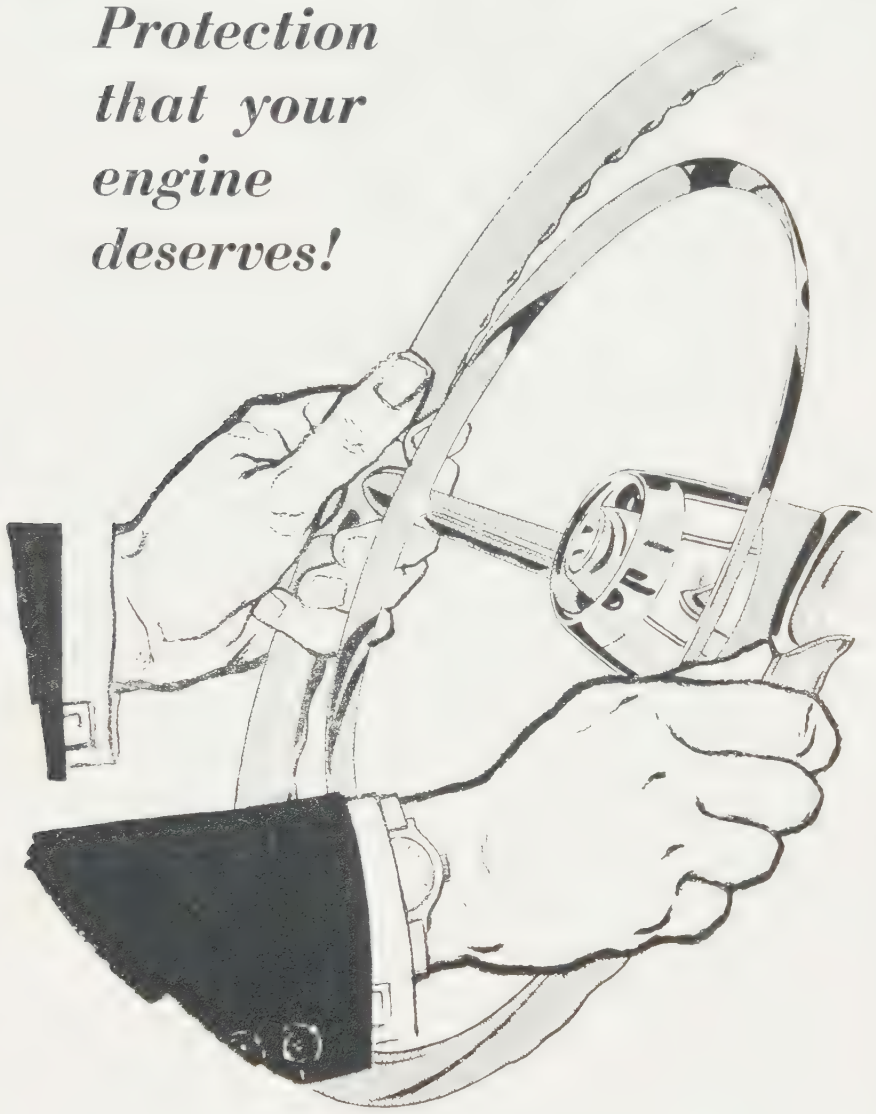

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are in the Administration building, and since its reading public is small, the membership recognized early that books could not be allowed to stack up after having been generally read. It was decided that no book would be retained longer than one year after delivery.

The price for re-sale to Koror Book Club members was set at 50c. per volume. The Yap District, our closest neighbour, which has recently established a library, offered to buy all the books we would sell them at $1.00 per volume. Since book sales in Koror were usually small, sales to Yap profitably disposed of all left-over books and sizeably increased our purchasing power. At the most recent book sale in Koror, very heavy local buying so reduced the number of books which could be more profitably sold to Yap that the membership decided that at future sales only five books could be bought on a membership at 50c. and that all over that number must sell for the Yap price.

A recent ruling of the Koror Book Club raised the re-sale price of any book retailing over $5.00 to $1.00 to Koror Book Club members and to $2.00 to Yap.

An additional small source of income has been transient memberships for such interested people as may visit Koror for limited periods. These are strictly reading memberships and cost 50c. a week.

One of the most appreciated prerogatives of the Koror Book Club members has been the ability to put orders for personal libraries through the Book Club at the same discount which the Club receives. Subsequent to our explanation that there were no retail book stores nearer than Hawaii, the San Francisco News Company extended the privilege of ordering books for mail delivery in the United States.

The success of the Koror Book Club can surely be duplicated elsewhere. It depends primarily on how badly reading material is wanted and secondarily on the interest and drive of the individual who organizes any similar book club or library. Professional library skills are not needed; but a genuine interest in reading and a fairly wide range of reading interests, together with a sense of humour and a certain elasticity of mind are almost essential.

PICTURE CREDITS

Acknowledgement is made for photographs reproduced in this issue as follows: Front cover and page 29, J. Boixo, Nouméa; 17, U.S. Department of Agriculture, New Crops Research Branch; 18, 19, 24, Jacques Barrau, SPC; 20, 21 (top left), Charles Hoyt, SPC; 25, 26, 27, 28, Donald E. Ross, Apia; 35, 36, 37, Information Service, Netherlands New Guinea; 40, 41, R. R. Mason, Honiara; 43 (left), 44 (left), H. A. P. C. Oomen.

Polynesian Society Of New Zealand

(Continued from page 52)

This last work (Memoir, vol. 24) was published in 1951, and contains 402 pages, the price being N.Z.42/- (to members of the Polynesian Society N.Z.35/-). It is arranged by island groups, the books and articles listed under each group being divided into subjects under such headings as: physical and mental characteristics, origins and migrations, religion, language, folklore, archaeology, etc. There is also a general index of authors and subjects.

This work is not a comprehensive survey of the whole of the literature on the Pacific. The listing of government documents and of material on political history is limited to their relevance to native affairs. In the field of ethnology proper, which is its main concern, it is a most valuable guide.

The establishment of the Journal made possible the publication of a considerable amount of interesting and important data, much of which would probably never have been recorded had the Polynesian Society not been formed. The subjects of the articles cover all areas of the Pacific and every aspect of the life of the people of the islands. The Journal is attractively printed in a large clear type and contains many illustrations and photographs. The language of the articles is usually English, occasionally French articles being followed by an English summary. The policy has aimed at encouraging the amateur observer, but the writings of high-ranking ethnologists appear in the Journal pages.

An index of the first fifty volumes of the Journal has been published.

Examples of articles found in recent numbers of the Journal indicate the wide range of interests of the Society. They include:

"Nikumaroro", by P. B. Laxton. (Nikumaroro is the name given to Gardner Island (Phoenix Group) by the Gilbertese settlers). This article is a lively account of the island's settlement in 1938 and the subsequent difficulties and achievement of its new inhabitants.

"Excavation of Gun Bungoh in South-West Sarawak", by Tom Harrison and M. W. F. Tweedie. Very little is known of the pre-history of Borneo, and this paper describes a first step toward filling this gap in Pacific knowledge. Gun Bungoh is a cave near Bau, fifteen miles from Kuching in south-west Sarawak. Thorough excavation of its floor produced evidence of early human occupation.

"Some Grammatical Notes on the Teop Dialect", by G. G. Carter. The Teop dialect is spoken by about 800 people in the north-west of Bougainville, Solomon Islands. The writer compiled an English-Teop word list for the use of native students, and in this paper

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outlines the general structure of the language.

"Te Puea Herangi, C.B.E., 1884-1952", by Eric Ramsden. Te Puea Herangi, widely known as Princess Te Puea, was the cousin of King Koroki. She was an outstanding Maori leader and recognized as the power behind the Maori throne. This account of her life reveals her forceful personality as well as describing some of her many achievements.

The subscription to the Society is N.Z.30/- per year. Life membership costs N.Z.£25. Members of the Society receive the issues of the Journal free and may purchase other publications of the Society at a reduced rate. Intending members of the Society are admitted to membership on the joint recommendation of a member of the Society and a member of the Council, and on approval of the Council. The present secretary is Mr. C. R. H. Taylor, of the Alexander Turnbull Library, Wellington. The present editors are Dr. W. R. Geddes and Mr. J. B. Palmer, M.A.

For its first 32 years the Society had no funds other than the subscriptions received from members, and some money from the sales of Reprints and Memoirs. Since then the Board of Maori Ethnological Research has provided additional funds, which has made it possible to increase the size of the Journal and to publish more Memoirs.

Collection And Preservation Of Pacific Islands Manuscripts

The manuscript listed below has been located and microfilmed by the Commission since the last Deposit Notice appeared in the April 1957 *Bulletin*. A copy has been deposited in the metropolitan library nominated by the French Government, and additional copies are available for purchase by research workers, librarians and others.

Deposit Notice No. 80

The following manuscript was made available by Le R. P. Gagnaire, Ouvea, New Caledonia. The original remains in his possession. The author was a missionary at Fayaoué, on Ouvea Island,

EMPRIN, R. P. Whegnai-French dictionary. c. 1900. i, 185 pp.

How to Obtain Copies

Microfilm positives of the above item may be obtained from the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, Australia, at a cost of 5/6 each.

Deposit Notices 71-72 Withdrawn

Deposit Notices Nos. 71-72 concerning German-Azira and Azira-German Dictionaries, by K. Holzknecht, were included by error and have now been withdrawn.

PACIFIC READING

Material in this section is contributed by the South Pacific Commission Literature Bureau. Any enquiries relating thereto should be directed to Box 5254, G.P.O., Sydney, Australia.

Notes and News

Pacific Reading. For several years now this section has included reviews of books for island reading (*The Book List*) and of films and filmstrips. In future these will not be included as a regular feature; instead, lists will be mimeographed from time to time, and distributed on a selective basis according to local interest. *Notes and News* will, however, be continued.

Wealth from the Coconut. All orders for this publication should in future be addressed to the Commission's Literature Bureau in Sydney and *not* to Messrs. Ure Smith as hitherto. The price remains at stg.2s. 6d., plus postage, with a discount of 25% for orders for a dozen or more copies. Versions have been produced in the following languages: English, French, Pidgin, Samoan, Tongan, Fijian, Malayan, Maori, Gilbertese, Trukese, Yapese, Palauan.

Unesco Source Book for Science Teaching. One of the resolutions of the Second South Pacific Conference reads:

> "The Conference is aware of the value of elementary science training in health education and requests the Commission to devise methods utilizing simple and inexpensive equipment".

An answer to this need would have been the Unesco production *Suggestions for Science Teachers in Devastated Countries*. Unfortunately that book, apart from the unsuitability of its title in the present circumstances, has for long been in the 'hard to get' category. However, the suggestions in it have now been thoroughly tried out in the field, especially in tropical areas, revised or added to where necessary, and republished under the title *Unesco Source Book for Science Teaching*. This is exactly the kind of book the Conference had in mind, and it is strongly recommended. The book is published through Educational Productions (England) at a price of stg.15s. and can be ordered through any bookseller.

A Recipe Book for Pacific Islanders. This book by Lucy Hamilton, Dietitian of the Department of Public Health in Papua and New Guinea, has just been published by Macmillans in association with the South Pacific Commission Literature Bureau. The published price of the book, which contains 162 pages, is stg.4s. 0d.

The author has of course concentrated on the cooking of foods commonly found in the islands, but she takes full account of present-day problems. For example, islanders may wish to cook old foods in new ways; then again, with increasing travel and widening horizons, many islanders are getting acquainted with new kinds of foods, both indigenous and imported; and finally, in many parts of the Pacific, nutrition educationists stress the importance of increasing the variety of foodstuffs in the diet. This book should therefore provide a most valuable 'follow-up' to Miss Hamilton's earlier book *Food And The Work It Does*. It provides a tremendous variety of recipes and methods, while ensuring that the suggestions stay within the competence and means of island readers.

It is felt that anyone associated with women's work in the islands will want a copy of this unique book.

Pacific Island Stories. *How the Crocodile Got His Teeth* is the title of a new book put out by Macmillans in association with the South Pacific Commission Literature Bureau. It contains nine animal tales from the Pacific. Several of these were first printed in the *The Papuan and New Guinea Villager*, a paper published by the Department of Education in that territory, by whose courtesy they have now been published; others are from Samoa, the Solomons, and Fiji. The book contains 32 pages and includes attractive black and white line drawings; it should make good reading for young people learning English.

Published price in London is stg.1s. 3d., and the author of the general series is G. N. Lansdown.

This book represents an attempt to secure publication of material written by island authors themselves without which there can be little future for a real island literature. It is therefore hoped that the book will receive much support from schools in the Pacific, so that further publication of materials by island writers will be possible.

A Photographic Geography for Oversea School Certificate

By A. J. F. WEST, B.Sc., F.R.G.S., and J. ROSE, B.Sc., F.R.G.S.

The twenty-five pictures in this book have been carefully chosen to cover many aspects of School Certificate geography. On the opposite page to each photograph is a series of questions with spaces for the student's answers. Typical answers to two of the photographs are included at the end of the book. Ready September. About *4s. 6d.*

Adventures in Geography

By W. G. MOORE, B.Sc., F.R.G.S.

This is the first of four books comprising a new course for children aged 9-13. All children love adventure, and it is through the medium of adventure, their own and other people's, that this series introduces them to geography. Profusely illustrated. Book 1, *6s. 6d.*
Books 2-4 in preparation.

The Blake Family *(Second Series)*

By G. H. HOLROYD, M.A.

Another series of four little illustrated readers about the day-to-day life of two real English children. Each book in the second series contains 36 pages, of which 12 are full-page photographs. *2s.* each.

George G. Harrap & Co. Ltd.

182 HIGH HOLBORN, LONDON, W.C.1

The Kon - Tiki Expedition

Thor Heyerdahl

This well-known title is the latest addition to the Bridge Series. It is the exciting story of how a handful of men crossed the Pacific in an exact replica of an Inca balsa raft, and proved the theory that in ancient times the primitive people of the Polynesian islands had come from Peru.

3s. 3d.

The books in the Bridge Series are designed to bridge the gap between simplified readers and full texts. Prepared within a vocabulary of 3,000 words with new words explained in a glossary, they will be especially suitable for Secondary School students and adult learners.

STAFF LIBRARY

General Editor:
C. R. V. BELL, O.B.E.

This new series has been planned in the hope that it will eventually cover the main school subjects together with aspects of teaching method and school administration. In this way a useful reference library will be built up for practising teachers, school managers and inspectors, while their low price and simple vocabulary will bring the booklets within the reach of all who are in any way concerned with education. Training College Students in particular will welcome the carefully planned layout, designed to enable the reader quickly to find whatever he is looking for and thus save a good deal of note-taking.

Already published

Teaching Lively English (Illustrated)
Examination Time (Illustrated)
The English System of Education

Each 2s. 3d.

These prices are London published prices and subject to alteration from time to time.

In preparation

School Discipline, Visual Aids, Boarding Schools, Reading, Writing, Arithmetic

LONGMANS, GREEN AND CO. LTD.
6 & 7 Clifford Street, London, W.1

The Legend of the Earth. There are more ways than one of 'giving instruction', and this book represents an indirect approach to the business of introducing youngsters (and the not so young) to ideas of soil conservation. It is by E. J. E. Lefort, Research Officer for Economic Development, South Pacific Commission.

The book presents some of the basic facts of soil conservation wrapped up in a charming and humorous fairy story. Ouélé is full of sorrow, for his land is useless and his crops won't grow. He blames the earth for being so unyielding, but his friend Boala disagrees; Boala knows the secret of the Goddess of the Earth, and tells Ouélé how he can find the Goddess; she will tell him what he must do. Ouélé sets out to find the Goddess, and, as readers will discover, there are some strange adventures ahead of him. He eventually discovers the secret of the earth and becomes a successful farmer.

M. Lefort has written a delightful story, the setting of which is New Caledonia; but the message is universal and we feel it could be read with profit and enjoyment by children almost anywhere. The book is illustrated with attractive two-colour drawings. At present only a French version is available, but an English version can be produced if there is sufficient demand. Inspection copies of the French version, or an English typescript, may be had free of charge from the Literature Bureau.

The French version is published by Messrs. Wolters (Holland) in association with the Literature Bureau, and may be had from the Bureau at stg.2s. per copy or stg.1s. 6d. per copy for 10 or more copies.

New Health Leaflet. The health leaflet *Keep Your Baby Clean* referred to in 'Notes and News' for July 1957 has now been produced through the Literature Bureau in co-operation with the Health Department of Papua and New Guinea. Written in simple English, and attractively illustrated with clear line drawings, this leaflet provides practical information at village reading level on the correct method of bathing a baby. Although primarily designed for Melanesian areas, the essential information in this leaflet could be easily adapted to suit other areas of the Pacific. The Literature Bureau would welcome enquiries from territories requiring adapted versions of this or any of the Bureau's previously-published health leaflets and pamphlets.

Single specimen copies of *Keep Your Baby Clean* can be obtained free of charge on application to the Literature Bureau; larger quantities can be purchased at £A.1/5/- per 100 copies.

HEALTH LITERATURE

The following health reading materials are available from the South Pacific Literature Bureau, Box 5254, G.P.O., Sydney.

A First Hygiene Book	A.3s.0d. a copy

LEAFLETS AND PAMPHLETS

Tina Protects Her Family	A.16s.8d. a hundred
Clean Milk	A.16s.8d. ,, ,,
Infant and Maternal Welfare Clinics	A.20s.0d. ,, ,,
Clean Water	A.29s.0d. ,, ,,
Fruit Juice for Baby	A.29s.0d. ,, ,,
The Pregnant Woman	A.20s.0d. ,, ,,

VISUAL AIDS

Films in the Commission library are marked with an asterisk before the title, and are available for viewing by any metropolitan or territorial government on application to the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, N.S.W., Australia. Age classifications, where given, are intended as a guide rather than a recommendation.

Films

YOUR HEALTH CENTRE. 16mm. 8min. Colour. Sound. Produced by Office of Inter-American Affairs. U.S.A.

A short but interesting colour film describing the important part played by a local health centre in preventing disease and maintaining the health of a community. The setting of the film is Latin America and the sequences depict the varied health services freely available, how nurses visit homes to tend the sick, and the work of health inspectors in maintaining good public health. The subject matter is well presented with an interesting commentary but the colour of the film is patchy at times.

LA VIE DE LA RUCHE. 16 mm. 492 ft. 12 mins. Black and White. Sound. French commentary. Je Vois Toit, Paris. Price—apply.

This short black-and-white film gives a clear account of the life and work of a beehive community. Beginning with general shots of bees around the hive, sequences show the collection of nectar and pollen, the filling of cells, egg laying, the feeding and development of the eggs and fertilization of flowers, etc. Many excellent close-ups show clearly many of the bees' activities and clear drawings are used to clarify difficult points. A good general interest film suitable for either adult or child audiences.

Filmstrips

NEW VILLAGE IN MALAYA. Produced by Central Office of Information, London. Black and White. 23 frames. Teaching Notes.

Subject: Family resettlement in Malaya.
Medium: Photographs.
Technical Standard: Average—Good.
Comment: This strip of excellent photographs illustrates life in a part of the world much in the news today. In Malaya many families previously living scattered on the jungle fringes and subject to terrorist attacks have been moved by the Government to closer settled areas; this strip tells the story of community life in Pokol Asom, a typical resettlement village in N.W. Malaya which now houses some 3,000 such displaced Chinese, Indian and Malayan families. Organized on democratic lines, the villagers are shown working together to improve their conditions and how, by co-operative efforts, they have built houses, schools and a community hall, and are already taking increased activity in all kinds of social activities such as Adult Education classes, the Women's Institute, and the formation of Boy Scout and Girl Guide groups. Photographs are well chosen, and supplemented by adequate teaching notes.

HOUSING IN WEST AFRICA. Produced by Central Office of Information. HMSO London. Black and White. 42 frames. Teaching Notes. Published price stg.5s.

Subject: Building developments in W. Africa.
Medium: Photographs.
Technical Standard: Good.
Comment: The aim of this strip is to describe some of the developments that have taken place in housing and civic buildings in West Africa. The first sequence of eight frames shows primitive houses in Nigeria; although unsanitary and unpleasant inside, the exteriors of these strange buildings are highly picturesque. After this introduction, the strip goes on to give an account of European influences on African architecture and the ways in which West Africa is trying to solve the housing problems and at the same time raise the standard of living conditions. The strip is well planned and the teaching notes are adequate and in places quite detailed.

OXFORD BOOKS

GRADED ARITHMETIC PRACTICE

Schools in the Pacific area have been wanting for a long time simple books on mathematics. We believe that this series will meet the need.

The scheme is designed for beginners; each page is basically a sheet of carefully graded sums, providing adequate practice work and revision material on the fundamental processes and number combinations.

A full description is given in each book of recommended methods, and every page is specially arranged for the pupil's ease in working, and the teacher's convenience in teaching and marking.

In the Teachers' Books, which contain all the answers printed in red, difficulties are analysed in such a way that the supervising teacher can find at once the stage any pupil has reached.

PUPILS' BOOKS *Manilla covers, each 2/6*
TEACHERS' BOOKS *Manilla covers, each 3/6*

1. Addition
2. Subtraction
3. Short Multiplication
4. Short Division
5. Money: Addition and Subtraction
6. Money: Multiplication and Division
7. Weights and Measures
8. Fractions

PROGRESSIVE ENGLISH DICTIONARY 3/6

This is a first dictionary for students who are learning English as a second language. Compiled by A. S. Hornby and E. C. Parnwell, it contains 320 pages, 8,500 words and 250 illustrations. It is designed for the student who has completed, or almost completed, an elementary English course. It will enable him to find the meaning of those words he meets in his reading, and to widen his vocabulary. Well-known in its board binding, this new edition is bound in limp imitation cloth.

All the above prices are sterling

OXFORD UNIVERSITY PRESS

346 LITTLE COLLINS STREET MELBOURNE

The Great South Sea *Roger Pilkington*

'Instruction laced with deeds of daring . . . may learn much about the exploits of Magellan, the tidal pull, atolls and Queen Salote.'—*Times Literary Supplement.* *Illustrated. 6s. 6d.*

☆

The Junior Spelling Dictionary *P. S. Freyberg*

Devised to help children of 6½ to 10+ in their written work, this book is the result of research work in New Zealand and Gt. Britain, where it has been successfully tested in schools.

Two-colour illustrations. 3s.

☆

How the Crocodile Got His Teeth
and other stories *G. N. Lansdown*

Fifth book in a series of animal fables. This book is published in association with the South Pacific Commission Literature Bureau and the nine stories are taken from the folklore of the Pacific Islands.

Illustrated. 1s. 3d. each

☆

A Recipe Book for Pacific Islanders
L. Hamilton

A large selection of simple recipes for Pacific Islanders. Both traditional and European recipes and methods of cooking are described.

Illustrated. 4s.

MACMILLAN & Co. Ltd. St. Martin's St., W.C.2

Commission Holds Seventeenth Session

(Continued from page 30)

Islands. The assistance of UNESCO will be sought for this project, in which students will be trained in simple printing methods, especially those suited for production of small editions.

Plans were approved for the production of a *Pacific Reader*, the content in outline to be Geography, Populations, Daily Life and Modern Life.

In 1958 the work of the Commission's Literature Bureau, set up in 1952 to stimulate the supply of reading matter for the islands, will continue along established lines.

Women's Interests

In 1958 the Commission will appoint a women's interests officer primarily to study and assist women's organizations in the Pacific. The Commission gratefully acknowledged the offer by a leading women's organization in the United States, United Church Women, to assist with this project.

1958 Research Council Meeting

The Commission's expert advisory body, the Research Council, comprises three groups of specialists in the Commission's three main fields of operation, economic development, health and social development.

The Commission has now decided that there need not necessarily be a full meeting of the Research Council in all three fields each year. Instead, specialists in each field may meet in rotation.

In 1958 the social development members will meet. They will consider the full social development programme, but will pay special attention to the subject of aided self-help, and the women's interests project.

Professor H. Belshaw of Victoria University College, Wellington, and Miss Freda Gwilliam, Assistant Educational Adviser in the United Kingdom Colonial Office, will be invited to attend the meeting as specialist consultants.

Fourth South Pacific Conference

The Commission accepted with appreciation the invitation of the Australian Government to hold the fourth South Pacific Conference at Malaguna, near Rabaul, early in 1959. (The Conference is a regional meeting of Pacific island peoples convened by the Commission at intervals of not more than three years.)

The Commission approved the agenda, which includes the following subjects for discussion by delegates:

Problems resulting from the impact of participation in economic development with reference to native land tenure and the growing of permanent crops.

The extension of tourism in the Pacific region and the economic and social implications to the people.

The study of the role and function of custom and beliefs in relation to infant and maternal welfare.

Broadcasting in the life of Pacific peoples.

The training of local leaders for participation in aided self-help projects.

The place of recreation, including sport and youth activities, in the community.

The impact of the modern technical and industrial world on the life and culture of South Pacific peoples.

Appreciation Of Secretary-General's Services

The Commission recorded its appreciation of the services during his three-year term of office of the retiring Secretary-General, Dr. Ralph Clarion Bedell. His successor, Mr. Thomas R. Smith, who is at present Secretary to the Government of Western Samoa, will take up appointment late in February 1958.

South Pacific Commission Technical Papers

Copies of Technical Papers, which are published both in English and French editions, may be procured from the South Pacific Commission, Nouméa, New Caledonia, or G.P.O. Box 5254, Sydney, Australia. Except where otherwise stated, price per copy, post free by surface mail, is 2/- stg. (2/6 Aust., 2/3 Fijian, 30 cents U.S., 1 New Guinea guilder)*.

NUTRITION

18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
22. **Chemical Composition of the Milk of New Hebridean Mothers.** F. E. Peters, biochemist, South Pacific Commission. February 1952.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
50. **Nutrition Investigation in New Caledonia.** Sheila Malcolm. October 1953.
58. **Bibliography of the Nutritional Aspects of the Coconut.** F. E. Peters. April 1954.
59. **Dietary and Nutritional Problems in the Pacific.** Dr. E. Massal. April 1954.
63. **Diet and Nutrition in American Samoa.** Sheila Malcolm. August 1954.
83. **Diet and Nutrition in the Trust Territory of the Pacific Islands.** Sheila Malcolm. July 1955.
85. **Etudes sur la Nutrition et l'Alimentation dans les Etablissements Francais de l'Oceanie** (Summary and Conclusion in English). Sheila Malcolm. April 1955.
95. **Bibliography of the Nutritional Aspects of the Coconut** (revised edition of T.P. 58). F. E. Peters. September 1956.
100. **Chemical Composition of South Pacific Foods**—An Annotated Bibliography. F. E. Peters. January 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
106. **Some Food Problems In The Pacific Islands.** H. S. McKee. May 1957.

PUBLIC HEALTH

12. **Tuberculosis Investigations by the South Pacific Commission in 1950.** May 1951.
24. **A Survey of Leprosy on the Island of Nauru.** Dr. C. J. Austin, Director, Makogai Leprosy Hospital, Fiji. April 1952.
27. **A Survey of Leprosy in the British Solomon Islands Protectorate.** Dr. C. J. Austin. July 1952.
56. **Leprosy in Netherlands New Guinea.** Dr. Norman R. Sloan. April 1954.
57. **Leprosy in the Trust Territory of the Pacific Islands.** Dr. Norman R. Sloan. April 1954.
62. **Leprosy in American Samoa.** Dr. Norman R. Sloan. July 1954.
64. **Dental Conditions in School Children of American Samoa.** Dr. Raymond G. Neubarth. August 1954.
67. **Ophthalmological Survey of the Trust Territory.** Dr. H. E. Crawford. September 1954.
69. **Leprosy in Western Samoa and the Cook Islands.** Dr. Norman R. Sloan. October, 1954
96. **Health Education In The South Pacific.** G. Loison and L. L. Keyes. September 1956.

MOSQUITO-BORNE DISEASES

17. **Conference of Experts on Filariasis and Elephantiasis, Tahiti: Summary of Proceedings.** September 1951.
33. **A Survey of Malaria in the British Solomon Islands Protectorate.** Dr. R. H. Black, School of Public Health and Tropical Medicine, University of Sydney. November 1952.
60. **Some Aspects of Malaria in the New Hebrides.** Dr. R. H. Black. May 1954.
61. **Malaria in the Trobriand Islands.** Dr. R. H. Black. May 1954.
65. **Annotated Bibliography of Filariasis and Elephantiasis.** September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
66. **Distribution of Filariasis in the South Pacific Region.** Dr. M. O. T. Iyengar. September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
68. **Malaria in the Torres Straits Islands.** M. Josephine Mackerras and Dorothea F. Sandars. October 1954.
80. **Malaria Control and Research in Netherlands New Guinea.** Dr. R. H. Black. March 1955.
81. **Malaria in the South-West Pacific.** Dr. R. H. Black. March 1955.
86. **Distribution of Mosquitoes in the South Pacific Region.** Dr. M. O. T. Iyengar. 1955. (8/- stg., 10/-A., 9/-F., $1.20, 4G.)
88. **Annotated Bibliography of Filariasis and Elephantiasis. Part 2.** Dr. M. O. T. Iyengar. Jan. 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
104. **Developmental Stages Of Filariae In Mosquitoes.** Dr. M. O. T. Iyengar. May 1957.
105. **An Investigation On Filariasis In The Berau Region.** H. de Rook. May 1957.
109. **Annotated Bibliography of Filariasis and Elephantiasis. Part 3.** Dr. M. O. T. Iyengar. July 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
110. **Enquete epidemiologique et entomologique sur la Filariose de Bancroft en Nouvelle-Caledonie et dependances.** M. Lacour et J. Rageau. (With Summary in English). August 1957.

TROPICAL CROPS

19. **Report on Copra Grading.** November 1951.
21. **Note on the Mycoflora of Rice Seed in the Territories of the South Pacific.** Dr. F. Bugnicourt, Director, Institut Francais d'Oceanie. January 1952.
31. **Cocoa Plantation Management in Western Samoa.** D. R. A. Eden, General Manager, New Zealand Reparation Estates, and W. L. Edwards, Assistant General Manager. October 1952.
36. **Cocoa Growing in Fiji Islands.** D. H. Urquhart, former Director of Agriculture, Gold Coast. December 1952.
37. **Cocoa Growing in Netherlands New Guinea.** D. H. Urquhart. January 1953.
38. **Coffee Growing in New Caledonia.** D. H. Urquhart. January 1953.
39. **Cocoa Growing in Western Samoa.** D. H. Urquhart. January 1953.
40. **Cocoa Growing in New Hebrides.** D. H. Urquhart. January 1953.
48. **The Management of Coconut Plantations in Western Samoa.** D. R. A. Eden. September 1953.
55. **Grading of Fresh Fruit Exports from South Pacific Territories.** April 1954.
82. **The Manufacture of Copra in the Pacific Islands.** W. V. D. Pieris. July 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
87. **L'agriculture vivriere autochtone de la Nouvelle-Caledonie,** par Jacques Barrau; precedee de l'organisation sociale et coutumiere de la population autochtone, par Jean Guiart. Janvier 1956. Available in French only. (20/- stg., 25/-A., 22/6F., $3.00, 10G.)
94. **Food Plants of the South Sea Islands.** Dr. E. Massal and Jacques Barrau. September 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
97. **Rice Production In The South Pacific Region.** R. Watson. October 1956.

PESTS AND DISEASES OF PLANTS AND ANIMALS

8. **Insect Pests in the Wallis Islands and Futuna.** From report by F. Cohic, Entomologist, Institut Francais d'Oceanie. December 1950.
9. **Report of Plant and Animal Quarantine Conference, Suva.** April 1951.
34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December 1954.
78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December 1954.
79. **A List of Insect Pests Recorded in South Pacific Territories.** Bilingual. August 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
101. **Parasites And Predators Introduced Into The Pacific Islands For The Biological Control Of Insects And Other Pests.** L. J. Dumbleton. March 1957.
107. **The Rhinoceros Beetle In Western Samoa.** R. A. Cumber. June 1957. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

ECONOMIC CONDITIONS

54. **The Pacific Islander and Modern Commerce.** V. D. Stace, Assistant Economist, Reserve Bank of New Zealand. March 1954.
89. **Small-Scale Industry for the South Pacific—Preliminary Papers.** Cyril S. Belshaw. March 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
90. **Industrial Activity in Selected Areas of the South Pacific.** K. H. Danks. March 1956. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
91. **Western Samoa—An Economic Survey.** V. D. Stace. June 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
92. **Economic Aspects of the Coconut Industry in the South Pacific.** E. J. E. Lefort. September 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

CURRENT RESEARCH

5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May 1950.
20. **Research Workers in the South Pacific (now T.P. No. 52).** December 1951.
29. **Current Research in the South Pacific in the Field of Economic Development.** July 1952.
43. **Research in Queensland in Tropical Plant and Animal Industries.** Jacques Barrau, Technical Officer, South Pacific Commission. May 1953.

* Abbreviations used in the above list for the currencies quoted are: stg. (sterling); A (Australian); F (Fijian); $ (United States dollars); G (New Guinea guilders).

52. **Social Science Research in the Pacific Islands.** December 1953. (Revised edition of Technical Paper No. 20.)
98. **Social Science Research In The Pacific Islands.** November 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
102. **Index Of Social Science Research Theses On The South Pacific.** April 1957. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

CO-OPERATIVES

1. **The Co-operative Movement in the Gilbert and Ellice Islands.** H. E. Maude. February 1949.
10. **Bibliography of Co-operation in the South Pacific** (Now T.P. No. 51). April 1951.
42. **The Co-operative Movement in Papua and New Guinea.** Prepared by the Registry of Co-operative Societies, Port Moresby. February 1953.
51. **A Bibliography of Co-operation in the South Pacific.** December 1953. (Revised Edition of Technical Paper No. 10.)
75. **Catalogue of the Commission's Co-operative Library** (Bibliography of Co-operation). January 1955. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)

COMMUNITY DEVELOPMENT

2. **Community Development.** March 1950.
11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** Howard Hayden, Director of Education, Fiji. May 1951.
26. **Further Education in the Cook Islands.** P. F. Henderson, Officer for Further Education, Cook Islands. July 1952.
35. **The Purari Delta—Background and Progress of Community Development.** November 1952.
45. **The Nimboran Community Development Project.** Dr. J. van Baal, Director of the Bureau of Native Affairs, Netherlands New Guinea. June 1953.
46. **The Koror Community Centre.** Reports supplied by the High Commissioner, Trust Territory of the Pacific Islands. August 1953.
74. **Educational Aspects of Community Development.** R. Thomson. January 1955. (4/- stg., 5/- A., 4/6F., $0.60, 2G.)
84. **The Communities Project Approach to Economic Development.** H. Belshaw. July 1955.

EDUCATION

3. **The Village Library.** April 1950.
4. **Visual Aids in Education in the South Pacific.** A. L. Moore, Visual Aids Consultant. April 1950.
13. **Vocational Training Facilities in Australia for Students from South Pacific Territories.** May 1951. (Out of print.)
14. **Educational Broadcasts to Samoan Village Schools.** Department of Education, Western Samoa. May 1951.
15. **Libraries for Beginners.** Dr. and Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July 1951.
32. **Types of Organization in Adult and Mass Literacy Work.** D. B. Roberts, Organizer of Island Literature, South Pacific Commission. August 1952.
44. **The Use of the Vernacular in Teaching in the South Pacific.** G. J. Platten. June 1953.
47. **Central Vocational Training Institution.** F. J. Harlow. August 1953. 5/- stg.; plans available sep., 5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
72. **Literacy Teaching for Adults.** Karel Neijs. November 1954. (5/- stg.)
73. **Educational Evaluation—A Documentary Survey.** J. C. Nield. December 1954.
99. **Education In The Pacific Islands—A Selective Bibliography.** C. Wedgwood. November 1956.

OTHER SUBJECTS

6. **A Preliminary List of Economic Plants of New Caledonia.** J. Barrau, Director of Agriculture, New Caledonia. July 1950.
7. **A Preliminary List of Plants Introduced into Tahiti.** July 1950.
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